HORSELESS AGE The oldest automotive paper published in the English language has been purchased by The Class Journal Co., its engineering features, and a part of its circulation, have been merged with AUTOMOTIVE INDUSTRIES

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXIX
No. 4

PUBLISHED WEEKLY
NEW YORK, JULY 25, 1918

Ten cents a copy
Three Dollars a year

Editorial Contents, page 3

Advertisers' Index—Next to last page

Master of the Load On Any Road

MASTER TRUCKS

2-ton "M," internal gear drive
2-ton "O," long wheel base, internal gear drive
2-ton "W," worm drive
2-ton "WL," long wheel base, worm drive
3½-ton "A," worm drive
5-ton "B," worm drive
6-ton Tractor "T"

Dealers of proven standing and ability are invited to write for proposition.

MASTER TRUCKS, Inc.
3141 S. Wabash Avenue
CHICAGO

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXIX NEW YORK—THURSDAY, JULY 25, 1918—CHICAGO NO. 4

Motor Truck's Essential Nature Presented to War Industries Board

Reasonable Steel Supply Assured—Trucks Sold Should Go Into Essential Uses—Makers Should Encourage Proper Use of Vehicles—Priorities Board Outlines Liberal Program

WASHINGTON, D. C., July 20—The essential character of the motor truck in transportation, and the necessity for a continuation of the industry during the war, were placed before the Priority Committee of the War Industries Board yesterday, and as a result motor truck manufacturers are assured a supply of steel for the manufacture of trucks and parts both for war and industry.

It was shown that approximately 90 to 95 per cent of existing motor truck users are essential to transportation and industry. Eighty per cent of the truck users at present are using their vehicles directly or indirectly for war work, and most of the remaining 20 per cent are used in domestic uses.

The truck industry was represented by the National Motor Truck Committee, and the National Automobile Chamber of Commerce, George N. Graham, chairman of the Truck Committee, presenting the arguments for the truck, in which a written statement was submitted.

The Priority Committee, headed by Judge Edwin B. Parker, took a very favorable view of the truck situation, and while there is a serious need for steel for war, and while the government could use more steel than will be produced this year, the War Industries Board realizes that certain industries must be properly supplied, and Judge Parker agreed that the motor truck industry is performing exceedingly valuable work and should be given the necessary steel even if such has to be taken from steel supplies needed for other war work, in order to allow it to increase its value as a transportation medium.

Summed up briefly, Judge Parker stated that steel would be assured to all truck manufacturers both for manufacture of repair and spare parts and for the manufacture of the trucks demanded by the yearly program on the condition that the truck makers will encourage proper use of trucks and will guarantee that all trucks sold will go to essential use. In consideration of the urgent Government demand for steel, and the fact that the steel for the truck industry will virtually come from the stocks designed for war purposes, the truck committee feels that the War Industries Board has displayed a comprehensive view of motor truck utility and has agreed to a broad and ample program for it.

Judge Parker stated that the necessary steel for motor trucks will be found providing the industry follows the three requests, which are:

1—Motor truck makers and agents use every facility for encouraging the widest possible proper use of trucks during the war.

2—Motor truck makers will comply with a list of essential truck users in making future sales.

The list of essential users is to be compiled by Mr. Graham and C. C. Hanch, Chief Automotive Section, War Industries Board, within the next 10 days and will later be checked and completed by the Priority Committee. It will contain at the outset every kind of truck user. Those not considered essential will be eliminated.

Written Presentation Sent

Motor truck makers and agents will work for the strictest conservation of those trucks now in the hands of consumers by urging their repair and maintenance so long as possible before replacement by new trucks. Owners and operators will be requested to repair and use the old trucks, operate them fully loaded and maintain shifts of drivers to secure the greatest use possible per day from each.

The written presentation sent to the Priority Committee recently follows in complete text. It tells of the shortage of steel now existing in all motor truck factories, of the utility of the truck as a method of transportation for both general and war work, of the Government recognition of the truck as a mode of transportation for war materials, food produce and general express work.

These are tabulated with the percentages. On Jan. 1, 1918, 400,000 trucks were used in this country, it is shown, with production indications for 1918 placed at 275,000 trucks of which 50,000 go to Europe for war work, 40,000 replace others worn out in this country, making a total of 185,000 to go into domestic use. This insures approximately 585,000 trucks in use in this country for 1919, and the committee estimated that these will individually average 10 tons haul per day or a total of 5,585,000 tons hauled daily by trucks. These figures impressed the Priority Committee.

Information Requested

Mr. Graham further explained at the hearing yesterday, which was attended by the Priority Committee, C. C. Hanch, and the truck committee, including George Graham, Pierce Arrow Motor Car Co., and chairman, Windsor T. White, White Co.; M. L. Pulcher, Federal Motor Truck Co.; David Ludlum, Autocar Co.; D. C. Fenner, International Motors Co., and S. A. Miles, National Automobile Chamber of Commerce, a number of other points important to the request for steel.

In reply to requests from the Priority Committee, made earlier this week, the truck committee telegraphed all truck makers for information as to:

a—How many completed and unsold trucks for domestic use each has on hand at the factory or in branches or agencies.

b—How many trucks each can build from material at present on hand.

c—For how many trucks each will require material to fill the domestic program for the remaining months of 1918.

d—How many trucks were produced by years for 1916, 1917 and the first 6 months of 1918 for the United States and the Allies.

e—How many trucks were produced for domestic purposes in the same period.

f—How much steel the aggregate number of trucks produced in that period required.

g—How much rubber the total number of trucks produced in that period used.

h—How much coal was needed per plant per year.

i—What war work other than truck manufacturing each plant was engaged in.

j—The passenger car business of each truck maker.

Inquiries for this information was sent to 144 firms and replies were classified into two series, those who made more than 100 trucks in the 2½-year period and those who made fewer than that number. It was found that 101 concerns made more than 100 trucks in the 2½ years. These manufactured 276,477 trucks between Jan. 1, 1916, and June 30, 1918, for all purposes, war and otherwise. Figures revealed show that 276,477 trucks required 492,129 tons of steel and 48,537 tons of rubber.

These figures give the average of 1.7 tons of steel and 200 lb. of rubber per truck.

13,000 Trucks on Hand

Thirteen thousand trucks, 1 month's supply, are all that the manufacturers have on hand, either completed or which can be completed from the parts and material in stock. This small amount displayed to the Priority Board the need for prompt relief to the truck industry provided it found the industry worthy.

One of the most impressive statements by the truck committee was to the effect that elimination of trucks at this time would be seriously injurious to the railroads, war and every war requirement, which was backed up with a detailed account of the functions of the motor truck. The chairman not only told how important these functions are but went into detail telling that trucks are being used for road work, cantonment provisioning government, warehouses, government and war housing building, by steel firms, express companies, oil companies, army shoe makers, army clothing and wool makers, food product concerns like the meat packers, dairy companies, electrical equipment makers and for shells, government furniture, feeding cantonments, farm products producers, tobacco growers and packers, coal mines and so forth and created a climax by telling that 28 5-ton Mack trucks were purchased this week by the Bureau of Mines which will deliver every ton of coal this next season to be used by the many government buildings here. The chairman enumerated more than 200 companies dealing in the above commodities for war purposes that used thousands of the trucks, and it was through this complete accurate tabulation that the Priority Committee realized how important the motor truck was.

900,000 Tons Hauled

The committee further told that 900,000 tons of war and other important merchandise is being hauled yearly between Philadelphia and New York by motor trucks, considerably augmenting the railroads and actually preventing serious railroad congestion. He described the Akron to Boston route used by the Goodyear company.

As far as can now be gathered the essential list of truck users will include a vast majority of existing consumers. Such concerns as department stores were mentioned and the Priority Committee taking a reasonable view, admitted that while some of the commodities purchased should be carried home, many others, such as furniture which is to a great extent an essential commodity, could not be carried and could best be handled by motor trucks. A truck consumer who is in some such business as jewelry and to some degree doing war work, can, if not on the essential list, arrange to purchase a truck demanded by his war work, by making application possibly to C. C. Hanch or to the Priority Committee as will be later arranged.

Following is the text of the written presentation sent to the Priority Committee by the truck committee:

Need of Motor Truck Makers for Materials and Fuel

Text of Presentation Before War Industries Board

"THIS presentation directs to the attention of the War Industries Board the imperative necessity of giving to motor truck manufacturers an advanced priority that will assure materials and fuel at once.

"Such action is urgently needed. Unless it comes immediately there will be an interval of months with virtually no production. This will have the direct result of delaying the war program.

"We believe that trucks used in this country are necessary to a swift winning of the war. On this basis alone we ask consideration.

"Careful analysis shows 101 motor truck manufacturers must between June 20, 1918, and Dec. 31, 1918, meet a demand for 103,961 trucks exclusive of those classed as war orders. They have completed, or have on hand materials for 13,044 trucks. This is a shade more than 12 per cent of the demand. The sales of one month will exhaust these 13,044 trucks.

"Some makers have no steel whatever.

"Steel and other metals must be found for the making of more trucks unless the nation's commerce and the war program are to be denied the transportation help the motor truck can give.

Utility Is Sole Criterion

"The motor truck is solely a utility. In this presentation we ask to have it considered separately from the automobile passenger car, which also is a highly important transportation medium, but not used exclusively for business.

"The motor truck discharges no function of entertainment.

"It furnishes transportation at a time when transportation is a vital material need.

"It is conceded that during the war we must have production. The motor truck is inseparably related to distribution of this production.

"Congested traffic constitutes a war problem.

"Production cannot be brought up to its ultimate unless sources of communication are regular and rapid.

"Insufficient transportation did more to retard the rapid and efficient entrance of the United States into the war than could a legion of Huns.

"This was proved last winter when to get transportation for coal to send ships to Europe with urgently needed supplies, the Fuel Administration found it necessary to stop all production for 5 days.

"Present shortages of coal and steel result largely from transportation deficiencies.

"There are three main sources of transportation, as follows:

"a—Railway.

"b—Steamboat.

"c—Motor Truck.

"The enormous growth of business and the extraordinary volume of war haulage have virtually overwhelmed both railroad and steamboat facilities. Both have more freight than they can handle. Only transportation over the highways offers any considerable possibility of immediate relief.

Trucks in War

"Almost all trucks serve their war purpose at this time. This applies equally to trucks that are going to the European battlefronts, and to those that will be used in this country.

"Many purveyors in war supplies have based their schedules of rapid delivery on the help of the motor truck.

"We can furnish your committee instances in which the truck has rendered a four-way service in this work. Such trucks haul away the dirt excavated for the foundations of a new building. Then they bring in material for constructing the building. Next they deliver raw material for making the product. Finally the truck completes its record of performance by carrying the finished articles to the point of delivery. Such trucks are just as valuable in handling war supplies as those used in France.

Government Recognition

"The United States Government has recognized the importance of the truck both for military and so-called domestic uses.

"War Department Order No. 38 established the Motor Transport Service for war trucks. The Highways Transport Committee, serving as part of the National Council of Defense, was organized to divert all possible traffic to the highways.

"Government trucks running from cities in the middle west to the seacoast are constantly establishing the practicability of overland delivery by power vehicles.

"The Department of Agriculture has encouraged the application of trucks to the moving of food.

"The Fourth Assistant Post-Master General is hauling farm products into the big cities, distances of more than 100 miles by motor trucks. His program, presented in a bill now before Congress, calls for the eventual establishment of 5000 miles of new roads, which will be built from the profits of motor truck haulage of food to market.

"Every truck put into service brings the manufacturer nearer his market, brings the farmer nearer the consumer, brings the finished war order nearer the shipping point, facilitates rapid filling of orders, supplies the equivalent of manpower lost by withdrawal of soldiers, makes less serious the shortage of horses, and restores gaps in organizations occasioned by deficiencies of labor, material and transportation.

"The farmer, dependent as much on rapid access to his market as on the productivity of his farm, finds the motor truck coming to his aid at a time when he cannot hire farm hands. A truck on a farm will replace from two to four men. It will carry twice the load in half the time. It will make available for other production 5 acres of land whose yearly crop is now required to feed a horse.

"It has been estimated that in view of the greatly increased production of food stuffs, wheat, rye, barley, oats, corn, beef, pork, mutton, eggs, milk, poultry and fruit, that 2,000,000 trucks could profitably be used between farms and markets. Only 450,000 motor trucks are now available for all lines of business. This is only 25 per cent of what could be applied to farms alone.

"The use of the truck in so-called rural motor express lines offers the best possible medium through which farmers, truck growers and dairymen may get to their markets. The truck is also being used for the delivery of live stock to stock yards.

"Some makers sell 60 per cent of their trucks to farmers.

"Many trucks are carrying raw materials to factories. The absence of the service rendered by these trucks would often mean that thousands of men would go idle for lack of the raw material on which they work.

"Some railroads have had to decree that goods consigned in less than carload lots cannot be delivered in any specified time. This ruling results from a shortage of rolling stock and equipment, and a general congestion in freight yards, terminal points and warehouses.

"The facilities of express companies for general work have been very much limited through the necessity of using baggage and express cars in troop movement. Therefore the purveyor in food supplies has found himself hard pressed to get transportation. He is placing increasing dependence on the motor truck.

"The development of heavy haulage companies operating between big cities and sometimes covering as much as 150 miles in their regular routes, is a significant development. The use of trucks in this kind of work is increasing by leaps and bounds, for the truck is superior for short-haul work and in making stops en route. It can deliver supplies to the door of the consignee. It saves time and labor.

"In many points it has been found necessary to place embargoes on movement by rail of certain kinds of freight within certain zones. The result has been to divert this haulage to local transportation and transfer companies, the medium in almost every case being a truck.

"All that has been gained by the application of these trucks will be lost if there is a shortage of trucks or of parts to keep present trucks in repair. There will be this shortage unless some immediate guarantee of material is given to the whole industry.

80 Per Cent in War Work

"Our inquiries, based on a questionnaire sent to various manufacturers, show that about 80 per cent of the output of motor trucks is being used in war work or related war activities.

"By war work is meant motor trucks sold to the United States or its Allies, to the Red Cross, to the Y. M. C. A., or for use in cantonments, hospitals, government war buildings. In related war activities we include trucks used in the construction of ship building plants, used in industrial plants where war materials are being made, used by manufacturers or merchants in hauling army supplies, used for motor express lines, including parcel post service, by farmers as motor omnibus or stage lines, together with their application to a variety of other uses relating to the war.

"This leaves a comparatively small percentage of trucks applied to unrelated war activities. Even this small percentage involves a service of practical utility and convenience.

"In order to make this usefulness clear, we have analyzed the sales of a foremost motor truck manufacturer for the period of 12 months' business in the year 1917. The appended arrangement by percentages will show that virtually every activity therein represented has some relation to the war:

Transfer and transportation	13.2%
Grocers	8.8
Contractors	7.6
Oil and gas producers	14.3
Coal dealers	4.7
Building supplies	5.0
Tool and machinery mfgs.	2.0
Lumber	3.5
Meat packers	2.7
Chemical manufacturers	1.3
Textile manufacturers	1.7
Public utility	2.3
Road building	.54
Iron and steel	2.0
Foundry and forging	1.5
Storage and warehouse	1.5
Milk	1.2
Farmers	.78
Ice	.92
Ammunitions	.39
Mining	.24
Stone	.1
Brick	.39
Gas producers	.83
Rubber	.73
Hardware	.98
Paper	.98
Paints	.88
Bakery	.88
Flour	1.2
Sugar	.83

"On Jan. 1, 1918, there were 400,000 trucks in the United States. It would be better for this country were the number five times as great.

"On the basis of the first 3 months production, there are indications that 275,000 trucks will be produced in 1918. Approximately 50,000 of these will go into war use in Europe; 40,000 will be used to replace trucks withdrawn by the law of wear and tear. This will mean not less than 185,000 trucks for domestic use.

"The smallest of these trucks has a capacity of 5 ton, the range progressing up to 10 tons with the aid of a trailer.

"The potenial haulage capacity of the 450,000 trucks now in use can readily be understood. Allowing an average of 10 tons a day per truck, an estimate which is small since many trucks in short haul work will move as much as 100 tons per day, we have a total of 4,500,000 tons of freight moved per day. Surely there can be no arguments in favor of restricting such a valuable service.

"Any delay in obtaining motor truck materials will eliminate the manufacture of parts necessary to keep in repair trucks now in use.

"This constitutes a serious problem, for there is constant need of replacement

War Steel for Trucks

"We genuinely believe that the need for trucks and for repair parts is so great that steel and other materials should be found for them, even though it has to be taken from some other items classed as war necessities.

"It means little to get rapid motor truck movement of war supplies in Europe if similar rapid movement lack at home.

"A way should be found to make to the motor truck industry a definite allotment of a certain percentage of the steel in sight, even though it be necessary to curtail some other war programs. We believe there are others less immediately vital.

"This recommendation is made with the full knowledge of its seriousness. It is based solely on our belief that trucks are important to the winning of the war, that the whole system of transportation in this country will be further handicapped unless they are supplied.

"It is essential to make a prompt decision for the guidance of manufacturers.

"It is necessary in the construction of motor trucks to plan ahead. Even material delivered at once cannot be converted into trucks in less than 3 or 4 months.

"Under the present system nothing is definite. A manufacturer cannot lay out his program. He works out his requirement and places an order with the producer of steel. The latter declines to enter it on his books because he is prevented from so doing by regulations of the War Industries Board. Often 90 per cent of material may be available, but lack of the other 10 per cent delays production.

"Therefore, valuable time is lost. Transportation needs are constantly growing. Action should be taken so that the motor truck manufacturer may supply his share of that transportation.

"We cannot think it is the purpose of the War Industries Board to allow this condition to continue.

"It might be possible to work out an arrangement by which each motor truck manufacturer would be permitted during the next 12 months to produce a certain number of trucks per month and to furnish replacement parts for trucks now in service. The allotment per month should be based on the sales of the last year.

"Each conern would report the amount of material necessary for its production allotment.

"Should the demand for any particular truck increase, this manufacturer could make application to be allowed to purchase an additional volume of material.

"In order to present necessary data we have requested motor truck manufacturers, not only those included in the membership of the N. A. C. C., but the unaffiliated as well, to answer these three questions:

"1—How many completed and unsold trucks for domestic use have you at your factory or in the hands of your branches and agencies?

"2—How many trucks can you build from the material at present on hand?

"3—For how many trucks will you need material to fill your domestic program for the remaining months of 1918?

Please note attached a record of the answers. These show that the stock of trucks on hand, or the material with which to build trucks, is virtually depleted.

Production Waits on Material

"By a study of the data you will find that nearly every manufacturer of motor trucks needs material. His stock in hand has been depleted by large purchases for war uses and related war uses.

"It has been our endeavor to make the presentation as brief as possible. If there is any further data you desire, we shall be glad to furnish it.

"The N. A. C. C. maintains in Washington a resident Motor Truck Committee composed as follows:

"George M. Graham (Chairman), Pierce-Arrow Motor Car Co.

"Windsor T. White, The White Co.

"N. L. Pulcher, Federal Motor Truck Co.

"David Ludlum, The Autocar Co.

"D. C. Fenner, International Motors Co.

"S. A. Miles, Natl. Automobile Chamber of Commerce.

"It is possible that the Priorities Section of the War Industries Board might deem it advisable to grant a hearing to this Commitee or to the industry as a whole, in order that the facts above presented might be furnished in more detail and that there might be an interchange of views.

"The National Motor Truck Committee is representative, since it speaks for the 55 principal manufacturers of motor trucks included in the membership of the N. A. C. C., as well as for many other companies not affiliated, but with whom it works in harmony and whose viewpoint it presents at this time.

"In making our case we have dealt only with the utility of the motor truck. We might also with entire propriety have called to your attention the very large investment in the industry, the number of men it employs, and the hardship that will result from failure to get material to keep its plants active.

(*Continued on page* 172)

American, British and Hun Planes at the Front

Upper—An American aero squadron in France

Left — British bombing machines ready for a flight over the Hun lines

Lower—Two German planes brought down by the British on the British front. The one at the right is a scout

Eagle Boats by New Ford Methods

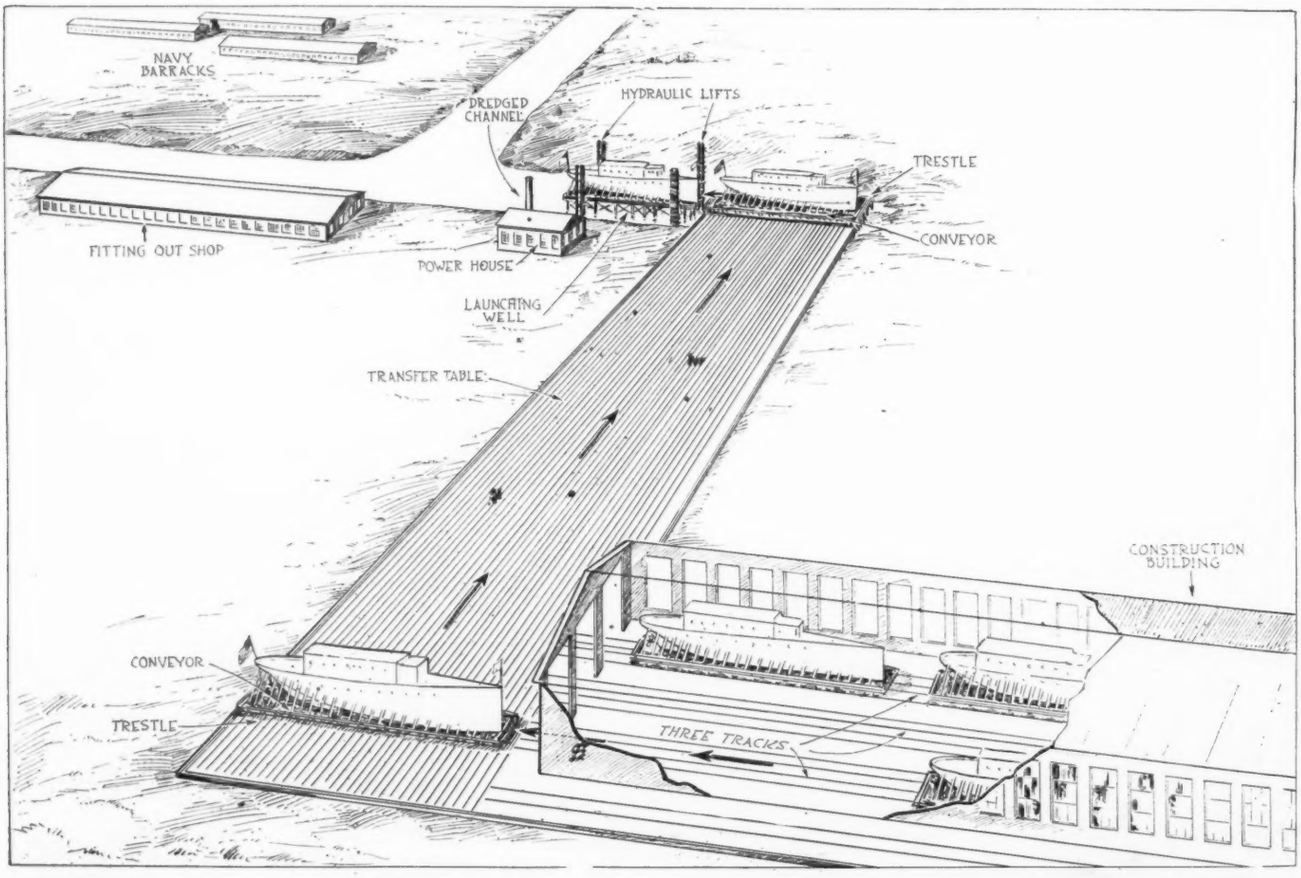
Naval Architecture on Progressive System Utilized to Attain Quantity Production of Submarine Chasers—Same Underlying Principle Used in Automobile Plant Put to Work in the Production of These Boats

WHEN Henry Ford took the contract to build the submarine chasers known as the Eagle boats, and stated that he would meet a production schedule of one per day, it was immediately concluded that new methods would play an important part in arranging for this production.

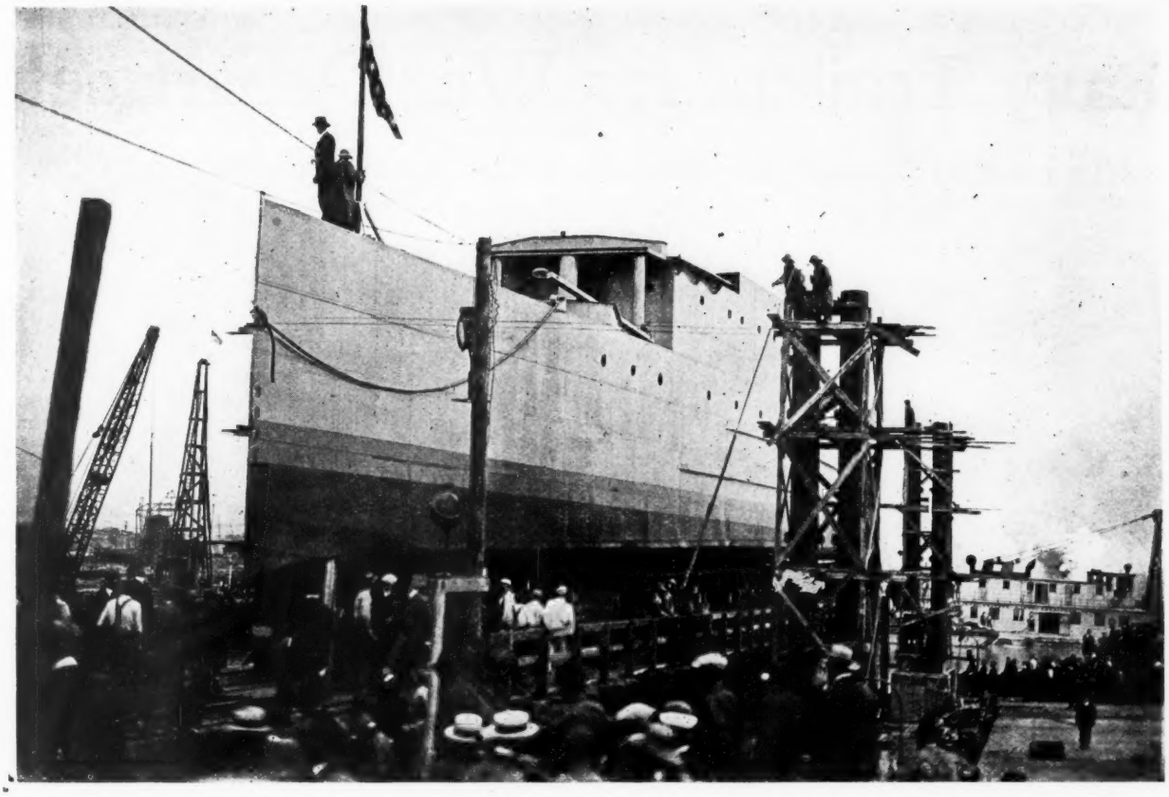
The methods employed have come to light with the launching of the first of the Eagles. Ford has put the same underlying principles used in his automobile plant to work in the production of these boats with the result that he has revolutionized the industry. Ford does not *build* boats; he is *manufacturing* them. The illustrations on this page show how the work is handled. The exact details are not given, neither are the drawings to scale, as it would not be advisable to print them; nevertheless, sufficient is given to show the fundamentals.

Under the Ford system, production is a straight line proposition from the time the keel is laid until the boat is launched from the hydraulic elevator. The boats are manufactured in a long building capable of carrying three abreast. The manufacturing operations are carried on while the boats are on cars and these cars pass along as various operations are completed until, when the boat is ready for launching, the end of the building is reached. The car, together with the boat upon it, is then carried out to the end of the launching pier.

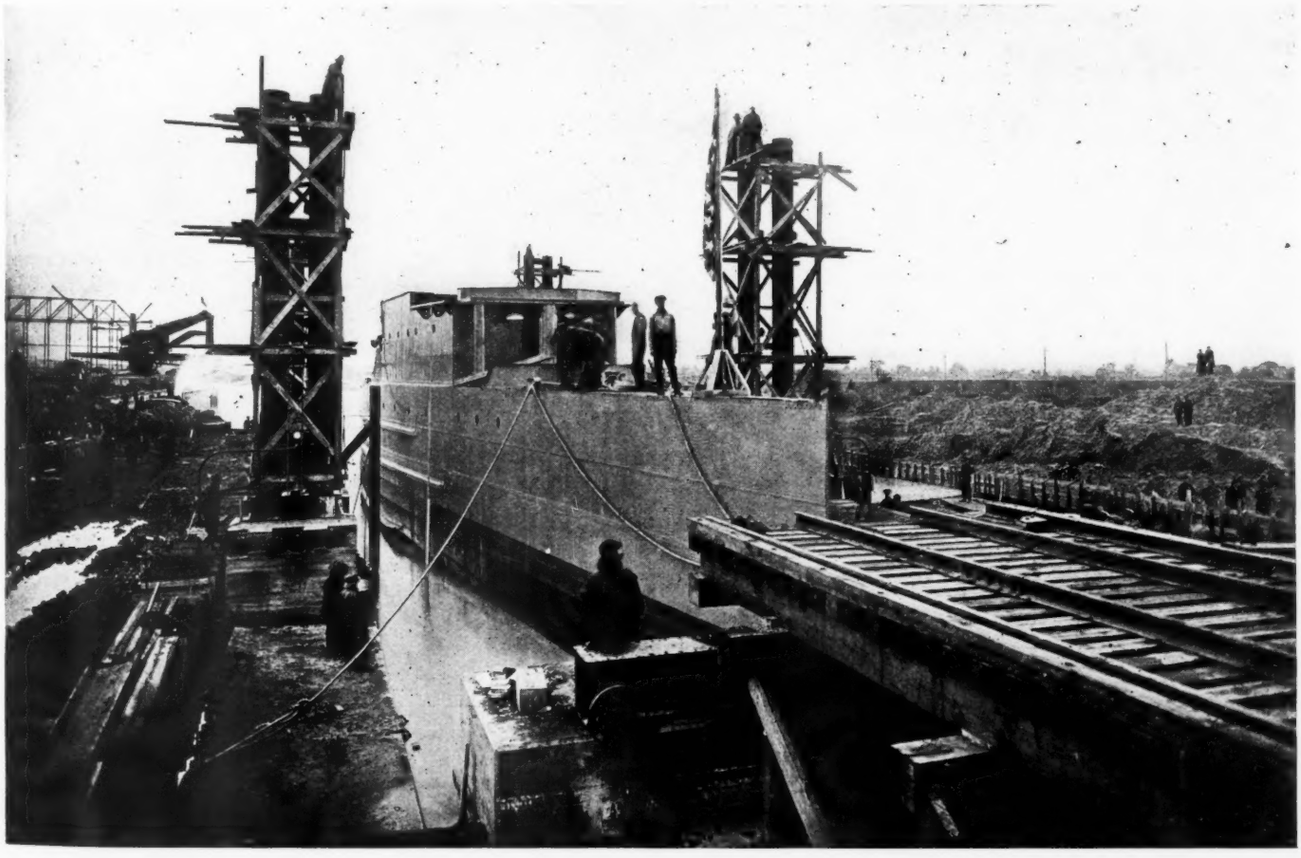
The launching is not done in the conventional manner. There are no launching calculations to make and the engineers of the yard do not stand with their hearts in their mouths waiting to see that the boat slides off the ways properly and that there have been no mistakes in the launching calculations. Instead, the end of the launching pier is a hydraulic elevator which gently lowers the boat into the water, lets it float off the car and then rises to allow the car to be returned to the end of the building for the starting of another boat.



Sketch showing the course the Eagles must take before reaching the water. From the large construction building an Eagle is brought out onto a trestle-like device operated by electricity and carried along sideways until it reaches other tracks on the launching table. After being pulled on this table the boat is lowered by means of hydraulic power. The area called the transfer table measures about 240 x 500 ft. and has on the floor sixteen single railroad tracks on which rides the trestle-like construction that carries the Eagle to the launching well



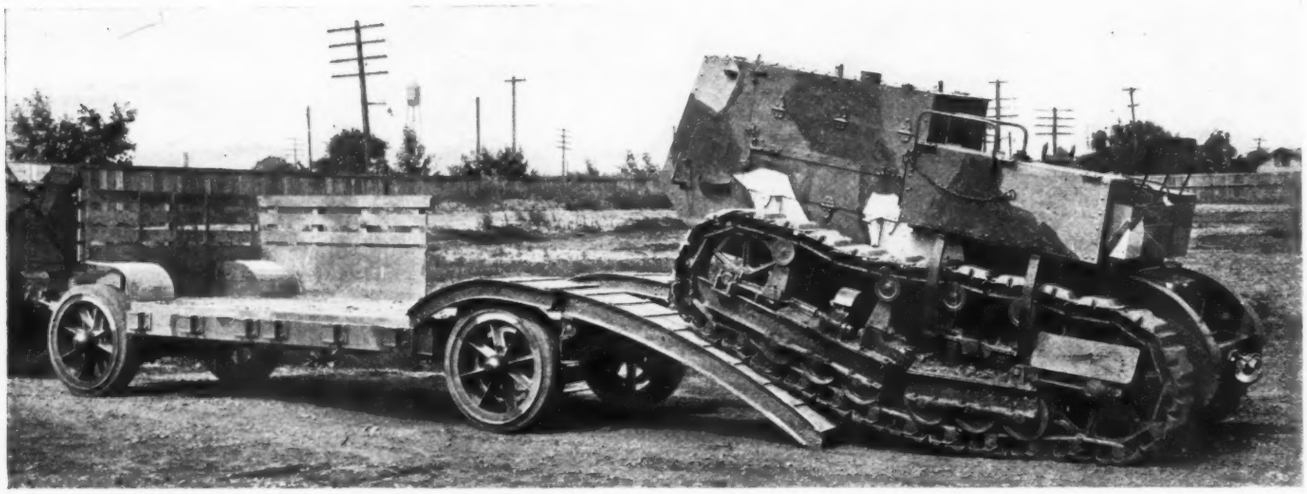
The first Eagle before it took its dip into the waters of River Rouge, July 11, at Ford's shipbuilding plant. With hardly a hitch, the 200-ft. boat was brought out of its housing and lowered into the water



The Eagle-1 was floated at 6.55 p. m. The end of the launching pier is a hydraulic elevator which gently lowers the boat into the water, lets it float off the car and then rises to allow the car to be returned to the end of the building

Heavy Trailers for War Department

Hauling Tractors to Double Their Speed and Save the Roads—Moving Guns and Heavy Equipment

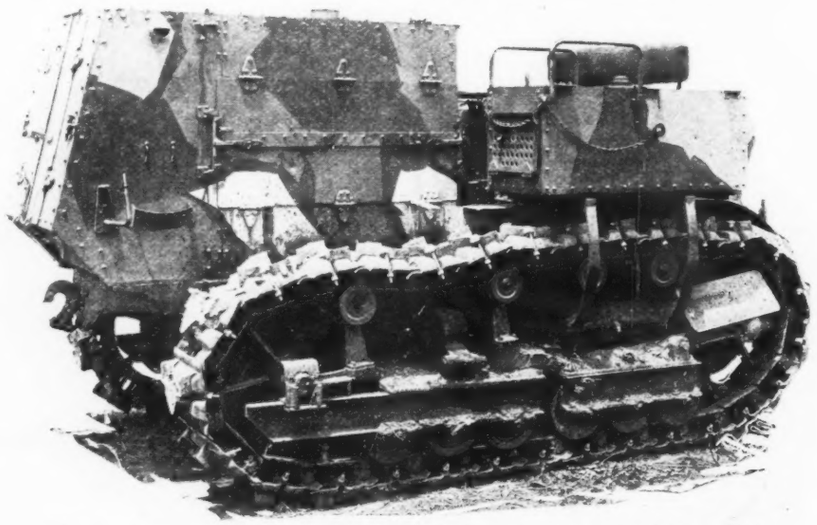


Five-ton creeper type of tractor mounting a 10-ton trailer on the special ramps provided for the purpose

THE peculiar demands of war work, particularly in the Ordnance and Signal Corps, and the rapid development of motorized equipment, are combining to produce some rapid developments in the trailer manufacturing industry. An unweildy piece of mechanism which, although mounted upon wheels, is incapable of traveling more than 6 or 8 m.p.h., can be mounted upon a trailer and transported at two or three times that speed with a resulting gain in efficiency and in time which may prove invaluable under war conditions.

There is no doubt but that the trailer industry is now only in its infancy and has much bigger prospects before it than would appear possible from superficial thought. The Signal Corps and the Ordnance Department have placed orders for tens of thousands of trailers of varied designs, and a number are already on their way to France and are proving to be highly successful. These trailers not only transport guns and form a firing platform for them, but also transport tractors of the track-laying or crawler type, which would be able to make only slow progress over the roads, and in fact, would be road destroyers, inasmuch as the track shoes are designed to obtain a hold on very rough ground and are equipped with growsers or other traction securing devices.

With a trailer it is possible to pick up the slow moving crawler or track-laying type of tractor and transport it to within a short distance of its field of operation, and make this transportation far more rapid than would be possible with the tractor itself and at the same time save wear and tear on the roads.



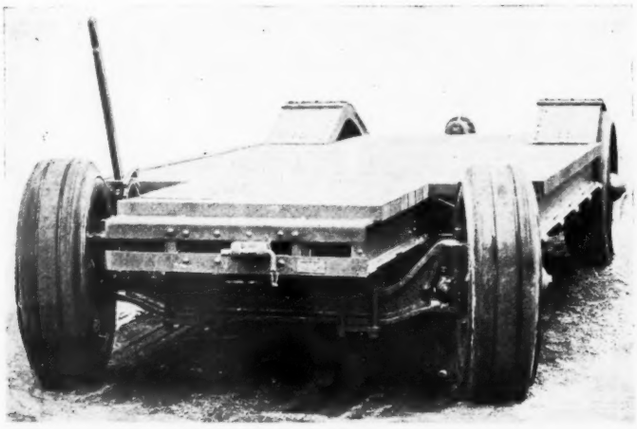
Five-ton armored tractor which is typical of the type of vehicle which can be more rapidly and efficiently transported over good roads on a trailer, but which is capable under its own power of negotiating very difficult conditions of traction

The track-laying type of tractor used by the Ordnance Department for pulling the 3-inch field guns and the larger 5-ton type is a good example of the sort of equipment which can be efficiently transported from place to place on a trailer. The four-wheel drive truck and other wheel types of vehicles used by the Ordnance Department form handy pieces of apparatus for transporting not only the trailer and its load, but also themselves carrying a fully loaded body.

The track-laying type of tractors now in use are capable of making speeds up to 12 miles per hr., which is exceptionally high for vehicles of this type, but running them continually at this speed places excessive

duties on the machine and is not productive of the highest efficiency. A speed of 6 or 8 miles per hr. for the 2½ and 5-ton types of creeper tractors is more in line with the limitations of the design.

Another big use to which the Ordnance Department and Signal Corps are putting trailers is for transporting shop equipment. These trailers have a capacity of about 4 tons and carry a complete repair shop capable of handling practically all emergency work behind the lines.

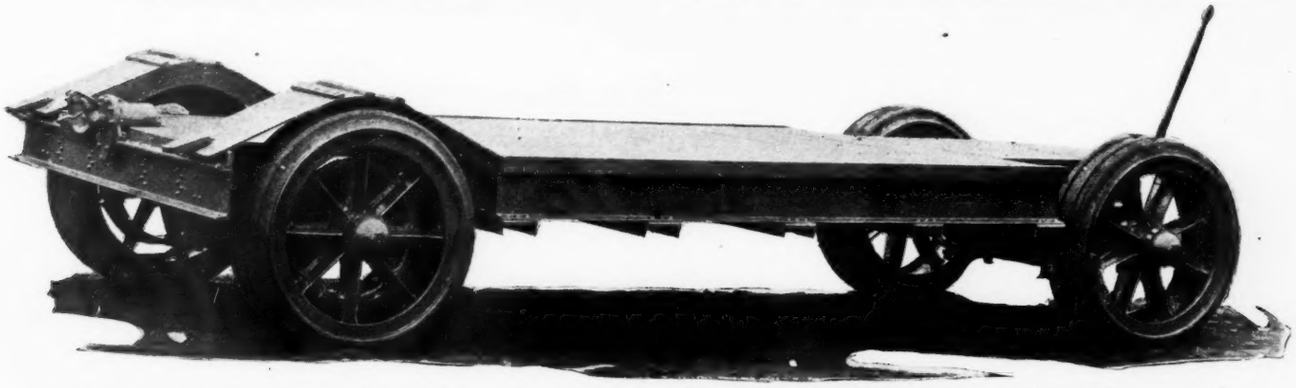


Ten-ton capacity trailer, showing the standard drawbar mounting at the front end with the wheel guard at the rear, and also showing the location of the brake lever at the forward end of the trailer platform

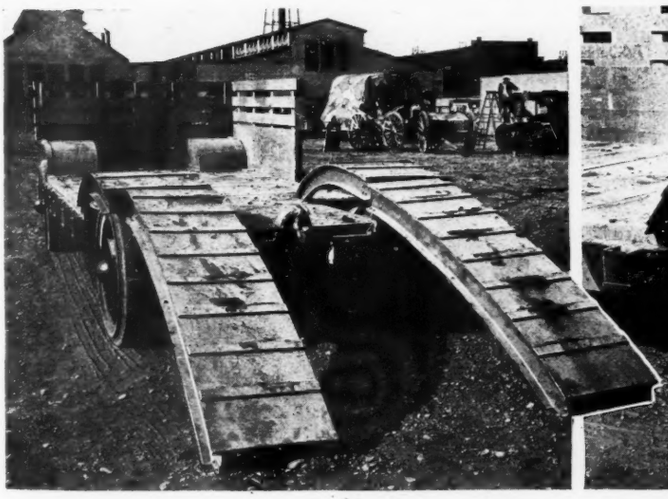
There are trailers upon which anti-craft guns are mounted in which the trailer itself is so designed that the gun need not be removed from it when it is fired. In fact, the trailer makes an ideal gun platform and the gun crew is placed upon the trailer in such a way that it can readily operate the gun and at the same time need not unload any of its equipment, so that it is possible to transport the entire apparatus rapidly from place to place. These trailers run all the way up to 10 tons in capacity for handling special loads.

For carrying the crawler or track-laying type of tractors the trailers are provided with loading means which permit the tractor to mount the trailers. These are in the form of ramps which are hooked to the rear of the trailer, allowing the tractor to mount itself upon the trailer under its own power. One of the illustrations shows a 5-ton creeper type of tractor climbing upon a 10-ton trailer, readily capable of transporting this tractor at a speed of 18 miles per hr. when towed by one of the standard Ordnance four-wheel drive type of vehicle.

The design of the trailers is naturally simple and is fairly well standardized except that some have four-wheel steer for easy maneuvering, while others have but two-wheel steer. The trailers are designed to operate in trains if so required, and are all fitted with the standard drawbar and steering lever arrangements by means of which the steering cross-arms are actuated by the movements of the drawbar. This allows the trailers to track accurately one behind the other in cases of long trailer trains. The rear wheel steer is generally locked in its position and is not in use unless actually required.



Typical type of trailer used in Ordnance Department work, showing standard pintle mounted on the rear end for towing other trailers



Loading ramps which are carried as part of the equipment of the 10-ton trailer

Method of providing wheel guards over trailer to protect wheels from damage in loading and unloading

A New Method for the Testing of Airplane Wing Ribs

How Load Application and Distribution Are Controlled by a Series of Rubber Bands—A Comprehensive Description of the Apparatus Employed

By Irving H. Cowdrey

THE construction of the airplane wing rib is such that the question of stress distribution through the various parts does not readily lend itself to solution by direct calculation. Hence the determination of the relative excellence of various designs becomes very largely a problem for laboratory solution. Laboratory tests have a value directly proportionate to the accuracy with which the actual conditions of service are reproduced.

The actual load borne by each individual rib is distributed non-uniformly over the length, and the rib itself is a member of astonishing lightness and frailty.

The problem to be solved in the tests here described seemed after some consideration to divide itself into the following heads which will appear in the same order in the subsequent discussion:

1. Methods of support or suspension.
2. The distribution of load.
3. Application of load with the proper distribution.
4. Accurate measure of the load.
5. Determination of the distortion of the member under test.

*Abstract of a paper read before the American Society for Testing Materials.

In the completed wing the ribs are connected by one or more continuous spars, passing from tip to tip of the wing. This affords secure lateral fastening at these points. To duplicate such a condition, the ribs were cut from a group or so fabricated as to leave in place a piece of spar about one inch thick.

This spar section may be seen at *A*, Fig. 4. In the cases furnishing data for this paper the two-spar suspension was used. To each of these spar sections was fastened a pair of steel plates ⅛ in. thick, each plate having in its center a ⅜-in. hole. The fastening was accomplished by means of four ⅛-in. steel studs having a nut on each end. These studs appear at *A*, Fig. 1, and the hole for one of them may be seen at *1*, Fig. 4. With these plates in place a 5/16-in. hole was bored through the wood to line as nearly as possible with the ⅜-in. hole in the steel (see *2*, Fig. 4). The holes in the wood were then reamed so that a ⅜-in. bolt with a finished shank could be just forced through by hand pressure. These ⅜-in. bolts served then as the points of suspension and from them straps (*B*, Fig. 1) were carried to the maple plank *C*, Fig. 1, which in turn was suspended from a pair of chain falls. The suspension bolts were set up as tightly as possible without producing clamping action

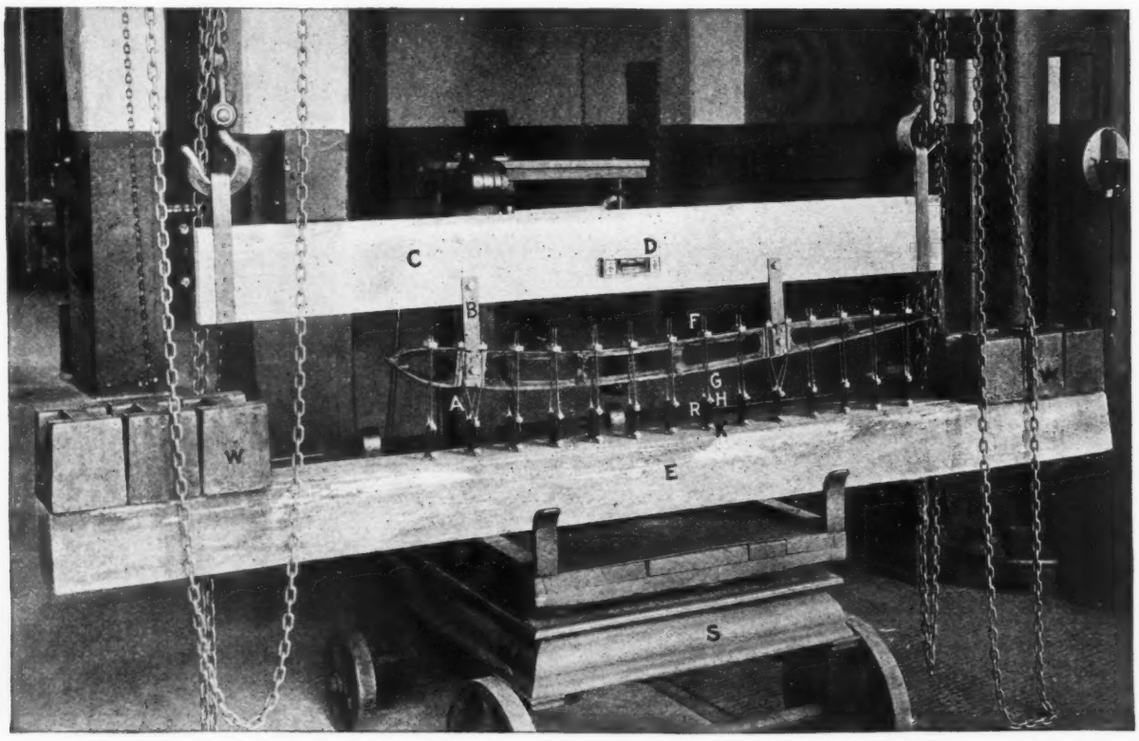


Fig. 1—Apparatus for testing wing rib, non-uniform load distribution

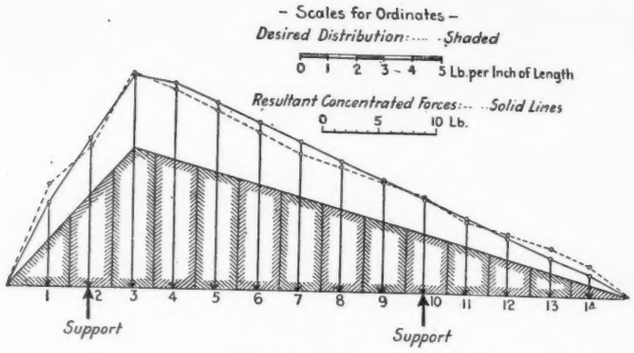


Fig. 2—Force distribution for 150 lb. total load

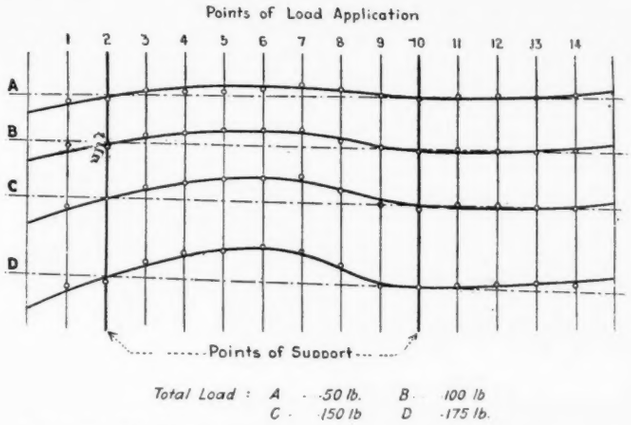


Fig. 3—Distortion of rib. Ordinates equal distortion with respect to a datum line through points of support. Ordinates are drawn full size in the above diagram

between the suspension straps and the side plates on the rib. This was to afford as much lateral support as possible without interference with freedom of vertical deflection under load.

[This method of suspension does not perfectly duplicate the supporting of the ribs in the frame of the wing. The attachment of the fuselage to the spars is such that twisting of the spar at these points is prevented to a large degree. Actual conditions would then, possibly, be more accurately reproduced if the straps *B*, Fig. 1, were clamped to the spar section in place of the intermediate side plates at *A*.]

The very nature of the purpose of the airplane wings indicates a distributed load. Accepted diagrams for the distribution of load on a rib show that the distribution varies under the varying conditions of flight, both in general outline and in the position of maximum intensity. Under such circumstances a representative load diagram must be arbitrarily chosen. For the purpose of these tests it was assumed that a straight-line diagram would be a satisfactory approximation. Moreover, it was assumed that the point of maximum intensity could reasonably be assumed at a distance of one-fifth the chord length from the leading edge of the wing. (Shaded area, Fig. 2.)

[Some tests have been made by various experimenters since those here described in which the point of maximum load intensity is further from the leading edge. In some of the design calculations this point is taken at mid-chord instead of as indicated above.]

Such a distribution, as well as the general dimensions of the members, precluded the possibility of anything in the line of sand or hydraulic cushioning. Hence, a truly distributed load seemed impossible. With the member under test the total length was 60 in. A load, more or less concentrated, applied at each 4-in. interval giving 14 points of loading, could be presumed to give a fair approximation to the distributed load desired, provided these individual loads be properly proportioned.

The common methods of construction provide for the entire removal of the web of the rib at frequent intervals. A reference to Fig. 1 will show the extent of such removal in the type of rib under test. The portions of the rib over one of these spaces act like secondary beams under load. A number of loading points less than was used in the tests under consideration produces, in the writer's opinion, very serious effects on the stress distribution throughout the rib. It would seem that the number of loading points should be greater than those used in this case rather than less.

Using the number of loads noted above the problem of proper proportionment was attacked as follows: The load diagram for a total load of 150 lb. is divided into 14 parts (see Fig. 2). The ends are triangles with bases each 6 in. long. The remaining divisions then take the form of trapezoids, with the exception of division 3. Each division has a 4-in. base. Each of these areas then represents the load distribution desired over a length bounded by its extreme ordinates. The computed resultant for each of these areas appears below:

Load No.	Load, Lb.	Load No.	Load, Lb.	Load No.	Load, Lb.
1	7.5	6	15.0	11	6.7
2	13.3	7	13.3	12	5.0
3	19.0	8	11.7	13	3.3
4	18.3	9	10.0	14	1.9
5	16.7	10	8.3		

The application of concentrated forces according to the above schedule then should give a loading quite comparable with that indicated by the straight-line diagram. Theoretically these fourteen concentrated forces should be applied at the centers of gravity of the respective areas. This has been done for numbers 1 and 14. In the other instances it has been assumed that the middle ordinate is sufficiently near to the center of gravity. This introduces an error of from 0.03 to 0.17 in. in the location of these resultants. In the case of the larger central forces this error in location is least. These resultant forces are shown as solid lines in Fig. 2. To aid in a comparison to be made later their ends have been joined by a solid line.

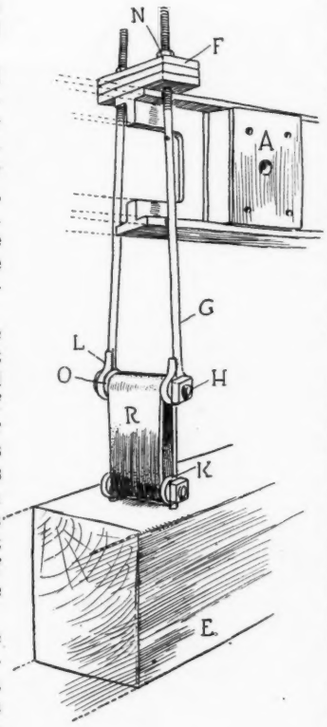


Fig. 4—Detail of loading device

The problem now resolves itself into one of the simultaneous application of fourteen different loads. Not only must the application be simultaneous, but the rate of increase in the application of each load must be such that under any total load whatever the relation between the various forces must be the same as the relation shown in the above tabulation.

Careful consideration of all well-known systems of multiple point loading lead to the final adaptation of what the writer believes to be a new departure in load application. It was felt that the most satisfactory solution of the problem could be reached by the application of load through a series of rubber bands of uniform properties whose widths should be made directly proportional to the load each band was expected to apply. These bands were obtained by cutting sections from a motorcycle inner tube. The particular tube used was of red rubber for a 28 by 3-in. tire.

With such an ideal series of bands, let one end of each be fastened to a rigid support, such as *E*, Figs. 1 and 4, and the other properly attached to the rib under test. The suspension of the rib as already described will permit it to be raised while a level (*D*, Fig. 1) enables a

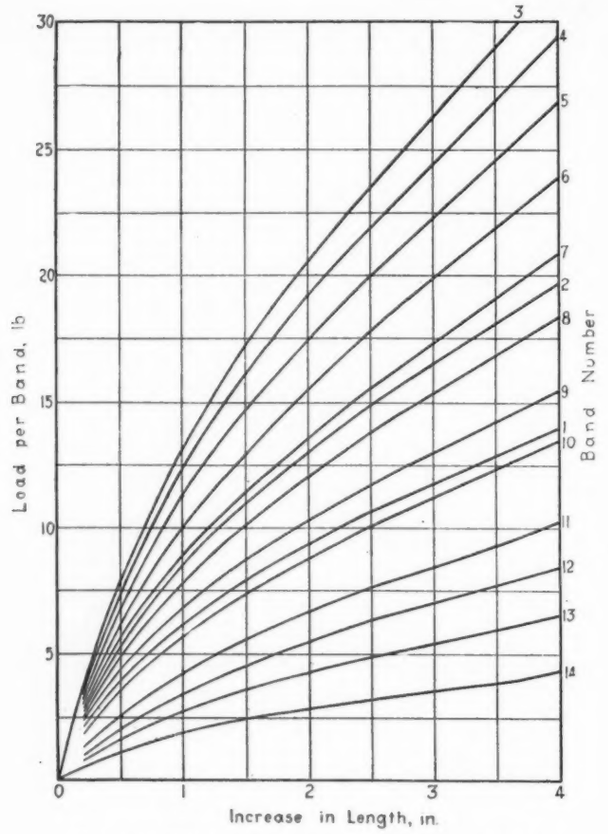


Fig. 5—Calibration curves for rubber bands

proper horizontal alignment of the supports. Under such conditions, neglecting the deflection of the rib itself, the fourteen loads will be applied at the predetermined points and with exactly the predetermined distribution.

In the device as illustrated by Figs. 1 and 4 the attachment of the bands is as follows:

Into the timber *E* are screwed at *K* heavy screw eyes of a size proper to take a ¼-in. stove bolt. Each pair of eyes are so spaced transversely on the timber that they permit on the bolt, between their inside faces, a pair of washers between which is a thin brass tube of a length equal to the width of the rubber band, *R*, which is to be used at that particular loading point. This gives the rigid fastening for one end of the band. Two ⅛-in. hard brass wires, *G*, with a soldered eye (*L*, Fig. 4) in the lower end of each, *H*, and threaded at the upper end, pass through a small wooden block at *F*. On the upper side of *F* washers and nuts (*N*, Fig. 1) afford a ready means of adjustment of the length of this stirrup-shaped device. A stove bolt with tube and washers (*O*, Fig. 4) passes through the eyes of the wire rods. Such device affords a proper means of attachment between the upper end of the rubber band and the member under test. The proper adjustment of these stirrups will be discussed later.

As will be readily seen from Fig. 1 the heavy timber *E* (in this particular test a 6 by 6-in. hard pine stick weighing about one hundred pounds) rests on platform scales, *S*. On each end of this timber are three 50-lb. weights *W*. With no tension in the bands *R*, the tare weight of the timber and weights is read on the scales. The plank *C* is raised and maintained level, thus stretching the bands and hence applying to the rib, loads according to the predetermined schedule. The summation of these fourteen loads may be obtained at any instant by balancing the beam of the scales and noting the difference between the reading obtained and the original tare weight. The accuracy of this determination depends solely upon the accuracy of the scales. This should usually be within a half pound.

Scales of the ordinary platform type were used in this method of test for two reasons: First, in the opinion of the writer a greater precision can be thus obtained than with any of the forms of testing machines commonly employed in laboratory work; second, it was desired to produce a method of testing that could be carried out easily by the manufacturer and permit and encourage experimental work on rib design by those who are not privileged to have at their disposal a properly equipped laboratory.

It is believed that the actual strength of a wing rib is but a partial solution of the problem at hand. The writer would not pose as an expert in aerodynamics nor in airplane design, yet to any engineer of analytical turn of mind the question of the effect of wing distortion must present itself. If the wing surface changes appreciably under conditions of flight does it not seem possible that some of the expectations of the designer may fall far short of fulfillment? If the designer expects so much lift, so much drift, and such a center of pressure, what unexpected factor enters into the problem through the possibly unforseen distortion of his aerofoil?

The possible importance of rib distortion would seem to make such determination a requisite adjunct to any satisfactory method of test. However, in view of the fact that many variables in the line of material and workmanship enter into the fabrication of each rib, it would seem that undue precision in the distortion determination is neither necessary nor advisable. A precision of 0.01 in. is doubtless satisfactory and such precision is possible with the device under consideration.

Throughout this discussion it is assumed that any distortion of the timber *E* which may occur is of such magnitude as to be absolutely negligible. As the plank *C* is raised the rubber bands become elongated. This elongation is measured by means of dividers set in center punch marks in the ends of the stove bolts *H*, *K*, etc. If there were no distortion of the rib, the increment of length of all bands would be the same under any given total load. Such is found not to be the case. For the particular test under discussion, these increments of length for loads of 50, 100, 150 and 175 lb., respectively, will be found in Table I. In Fig. 3 these increments of length have been plotted from arbitrary reference lines not shown. Now points 2 and 10 are the points of suspension as well as loading points. Hence so far as the rib is concerned these are points of zero deflection.

In each curve of Fig. 3, straight lines have been passed through the intersections of the curve with these two ordinates. Such lines serve then as lines of reference from which the actual distortion of any part of the rib may be determined for the particular load in question. The distortion curves are drawn showing the rib in its true position in flight. It will be noted that with the load distribution assumed, the particular rib under investigation showed a noticeable droop of the leading edge with a corresponding up-tilting of the trailing edge. Whether this distortion is of a magnitude and nature to affect the aerodynamics of the craft in flight is not within the province of this discussion. In the interpretation of these curves it must be borne in mind that while the ordinates are plotted full size, the chord length of the rib is vastly contracted.

TABLE I—DETAILED LOAD INVESTIGATION

Band No.	Initial Reading, In.	Load by Scales, 50 Lb.			Load by Scales, 100 Lb.			Load by Scales, 150 Lb.			Load by Scales, 175 Lb.			Band No.
		Length, In.	Increase in Length, In.	Force from Curves, Lb.	Length, In.	Increase in Length, In.	Force from Curves, Lb.	Length, In.	Increase in Length In.	Force from Curves, In.	Length, In.	Increase in Length, In.	Force from Curves, Lb.	
1	2.47	2.87	0.40	3.4	3.45	0.98	6.2	4.36	1.89	9.1	4.96	2.49	10.7	1
2	2.50	2.88	0.38	4.4	3.50	1.00	8.7	4.34	1.84	12.5	4.96	2.46	14.7	2
3	2.47	2.80	0.33	5.7	3.39	0.92	12.5	4.23	1.76	19.1	4.81	2.34	22.7	3
4	2.47	2.80	0.33	5.2	3.37	0.90	11.5	4.20	1.73	17.7	4.75	2.28	20.7	4
5	2.47	2.80	0.33	4.8	3.35	0.88	10.4	4.17	1.70	15.9	4.73	2.26	18.8	5
6	2.53	2.84	0.31	4.1	3.41	0.88	9.3	4.22	1.69	13.9	4.76	2.23	17.5	6
7	2.54	2.82	0.28	3.7	3.41	0.87	8.1	4.21	1.67	12.2	4.79	2.25	14.6	7
8	2.53	2.84	0.31	3.5	3.46	0.93	7.6	4.29	1.76	11.1	4.87	2.34	13.2	8
9	2.52	2.86	0.34	3.3	3.50	0.98	6.8	4.37	1.85	9.8	4.98	2.46	11.7	9
10	2.52	2.88	0.36	2.9	3.52	1.00	5.7	4.40	1.88	8.5	4.99	2.47	10.0	10
11	2.53	2.87	0.34	1.9	3.51	0.98	4.3	4.37	1.84	6.4	4.99	2.46	7.6	11
12	2.55	2.89	0.34	1.5	3.55	1.00	3.5	4.40	1.85	5.3	5.00	2.45	6.3	12
13	2.58	2.93	0.35	1.3	3.58	1.00	2.7	4.44	1.86	4.1	5.03	2.45	4.8	13
14	2.52	2.85	0.33	0.7	3.51	0.99	1.9	4.38	1.86	2.7	4.96	2.44	3.2	14
			Sum	46.4			99.2			148.3			176.5	
		Discrepancy		−7.2%			−0.8%			−1.1%			+0.9%	

While there was every reason to believe that the method of loading described in the previous pages would yield a load distribution quite closely in accord with that indicated by the diagrams of Fig. 2, still it seemed desirable to check the loads as carefully as might be. Such a check investigation is described in the following text.

Each band, after being cut to the proper width, was calibrated to determine the load-elongation relation through and somewhat beyond the range expected to be used in the rib test. These calibration curves appear in Fig. 5. For convenience in use, the increment in length has been plotted as abscissa rather than the actual length of the band. It should be noted, however, that the original length of the bands varied not over 0.02 in. The "band number" refers to the position of the band in question in the loading scheme (see Figs. 2 and 3). During the test, as has been previously noted, readings were made so that the increment in length is known for each band at each of the four specific loads investigated.

This increment, by reference to the calibration curves of Fig. 5, makes it possible to determine the force applied at *each* of the fourteen loading points. For any given set of readings, the sums of the individual forces thus determined should, of course, check with the summation as indicated by the reading of the scale beam. The closeness of this check between the apparent and actual summation is indicated in Table I. With the exception of the 50-lb. load investigation the discrepancies average about 1 per cent. It is only to be expected that the discrepancy for very small loads will be largely due to the difficulty in making accurate interpolations on the calibration curves.

Detailed Comparison Made

A detailed comparison has also been made between the computed and applied forces for a total load of 150 lb. Such comparison is shown graphically in Fig. 2. The forces as determined by the calibration curves have been plotted in the figure and the ends of ordinates thus obtained are joined by the dotted line. The closeness with which this follows the solid line joining the ends of the ordinates representing the desired forces would indicate that the method which has been herein discussed should prove satisfactory for this type of investigation.

It is necessary to make a very careful adjustment of each stirrup before attaching the rubber bands, in order that when the plank and rib are raised for the application of load, each band shall start elongating at the same instant. The most satisfactory of the methods tried is as follows: Lower the rib until the lowest point of the bottom edge will clear the timber *E*, Fig. 4, by some convenient amount. A single bolt should now be passed through the eyes in the timber *E* and through the eyes of the corresponding stirrup. By means of the adjusting nuts *F*, the stirrup may be brought to the proper length. When each stirrup has been thus adjusted, the level *D* should be set by means of the slotted end fastenings, so that the bubble will be in the center of the glass.

With all the above precautions observed, the stirrups may be released from their companion eyes, the rib and attachments raised and the rubber bands put in place.

The Rubber Bands

The tube from which these bands were cut was of uniform thickness throughout. This uniformity is very convenient since less care is necessary in adjusting the bands than would be requisite if the thickness varied as is the case with some types of tubes. It is believed that in cutting bands from a tube, as was done in this investigation, the width may be obtained accurately to about 0.01 in. In choosing the scale of width there are two antagonistic conditions to be considered:

1. It is desirable that the length increment of the band under load should be large compared with the deflection of the member under test so as to minimize the error in loading due to the variation in length increment of the various bands.

2. The maximum load applied by any band should probably not exceed one-fifth the strength of the band. This would be somewhat dependent upon the quality and resiliency of the material used.

The bands used in this test were of material showing a strength of about 125 lb. per inch of width when tested as a band. The elongation at fracture was about 1000 per cent.

It would seem feasible to substitute for bands cut to a predetermined width as in this case, some of the better grades of para rubber bands, which may be purchased in definite sizes. Combinations of such bands could be used in parallel and tested by calibration, so as to obtain the desired force at each point of loading.

For the highest refinement it might be desirable to calibrate the bands, allow a period of rest, make the test and recalibrate after a second period of rest, using as a calibration curve the mean of the first and last determinations. In the opinion of the writer this double calibration should not be necessary. In order to justify this belief and to determine whether or not any appreciable change may be expected in the characteristics of the rubber bands within a reasonable time, a second calibration was made on half the bands six months after the calibration made to determine the curves of Fig. 5. The data for the original and secondary calibrations appear in Table II.

In the analysis of this table three things must be borne in mind:

1. The data were intended to serve as a basis for plots. In drawing the representative curves the slight variations will not appear, hence the algebraic sign of the variations has been recognized in computing averages.

2. The elongations may be in error ± 0.01 in.

3. The testing machine used has a precision of probably no better than ± 0.1 lb. within the range of load used.

When these last two items are taken into consideration it is very evident from an examination of the averages that the variations are negligible in all the bands quoted except perhaps band No. 3.

If the variation in the properties of the bands during a six months' period are negligible the short time variation need be given no great consideration.

Lateral Support

The rib pictured in Fig. 1 was tested to destruction with the apparatus as shown. It is true that these ribs receive certain lateral support at one or more intermediate points by means of the stringers. If it is desired to apply such support,

TABLE II—CALIBRATION OF RUBBER BANDS

Band No.	Length Increment, In.	Load, Lb.		Variation, Lb.
		October	April	
1	1	6.1	6.3	+0.2
	2	9.3	9.4	+0.1
	3	11.8	12.0	+0.2
	4	14.1	14.6	+0.5
				Aver. +0.25
3	1	13.1	13.6	+0.5
	2	20.6	20.8	+0.2
	3	26.3	26.6	+0.3
	4	31.6	32.2	+0.6
				Aver. +0.40
5	1	11.4	11.5	+0.1
	2	17.4	17.4	0.0
	3	22.0	22.2	+0.2
	4	26.9	27.1	+0.2
				Aver. +0.13
7	1	8.8	8.8	0.0
	2	13.4	13.4	0.0
	3	17.1	17.2	+0.1
	4	20.8	21.0	+0.2
				Aver. +0.08
9	1	6.7	6.5	−0.2
	2	10.1	9.9	−0.2
	3	12.9	12.8	−0.1
	4	15.6	15.6	0.0
				Aver. −0.13
11	1	4.3	4.4	+0.1
	2	6.8	6.6	−0.2
	3	8.4	8.5	+0.1
	4	10.3	10.2	−0.1
				Aver. −0.03
13	1	2.9	2.7	−0.2
	2	4.3	4.3	0.0
	3	5.4	5.5	+0.1
	4	6.7	6.6	+0.1
				Aver. 0.00

there are several ways by means of which this may be accomplished. Three of these will be enumerated below.

1. To the plank *C*, Fig. 1, there may be fastened side pieces of white oak. These should be made with a typical "buck-stave" contour and held rigidly by through bolts. They should extend well below the lower edge of the rib. The inside faces should be polished with oil and be slightly lubricated before the test. They should be made and adjusted, by shims if necessary, so that a clearance of about 0.01 in. is present between them and the rib.

2. This type of support may be modified by using the "wooden buck staves" so separated that a yoke furnished with end rollers may be fastened to the rib at the upper and lower edges, and so adjusted that these rollers shall bear on the supports.

3. Some type of straight-line motion may be used. The supporting frame for this linkage may be fastened to the plank *C*.

In the opinion of the writer the type of lateral support first described should prove satisfactory.

Distortion Readings

It has been previously stated that the curves of Fig. 3 give an indication of the distortion of the rib. This is open to a slight objection, at least with the type of rib illustrated by Fig. 1. Several of the loads are applied at points beneath which the web has been largely cut away. At these points there enters a disturbing secondary beam action superposed upon the distortion of the rib as a whole. No attempt has been made to correct for this effect.

With the calibration curves at hand it is possible by means of the nuts at *N*, Fig. 4, to adjust the length of the stirrups during the test so that the load actually applied is exactly equivalent to that computed in the preliminary calculations according to the method shown by Fig. 2.

Extension of the Principles Involved

While this method of testing was developed to meet the exigencies arising in the testing of aircraft wing ribs, it is felt that it possesses the possibility of wide application. A number of ribs may be tested as a unit with any system of loading which experimental evidence or theoretical aerodynamics may suggest. A spar, a wing section, or any portion of the frame or of the completed craft may be loaded and the behavior of that portion may be investigated. The magnitude of the forces involved may be many times greater than those arising in the test herein described. Rubber tubing may be readily obtained which will yield bands showing a strength of 400 lb. per inch of width. Using bands of this type 6 in. wide will permit the application of forces of 500 lb. each.

With such forces spaced 2 in. apart, loads of 3000 lb. per lineal foot are possible. Under loads of such magnitude a very massive member must be used to replace the number *E*, Fig. 4. It would also seem possible to conduct tests in which the forces shall not be confined to a single plane. The chief difficulty to be surmounted would be that of constructing a suitable supporting frame to afford points of attachment for the various devices which would be found necessary in the application of the desired loads.

Alien Enemies and Enemy Property

WHO is and who is not an alien enemy and what is and what is not enemy property, are clearly set forth in a statement recently issued by the Alien Property Custodian, A. Mitchell Palmer. It is surprising to some of us to learn that a German citizen may not be an enemy, while a peaceful American citizen sometimes is. Such however seems to be the case.

Enemy property, according to the Alien Property Custodian, includes any and every kind of property, money, chattels, securities, lands, indebtedness, accounts receivable, etc., which belongs to an enemy. Even if the property is held in the name of another—by a dummy or in trust—if the real beneficial interest belongs to an enemy, it is enemy property.

An enemy under the Alien Enemy Act is:

1—Any person regardless of citizenship or place of birth, which is within the boundaries of Germany, Austria-Hungary, or their allies, or within the territory actually occupied by their military or naval forces. A peaceful and law-abiding German or Austrian citizen residing in the United States is not an enemy; but an American citizen living in enemy territory is an enemy.

2—A person residing outside of the United States and doing business within the territory of enemy countries or their allies.

3—A corporation, if incorporated within the territory of enemies or their allies, or incorporated in any neutral country and doing business within the territory of enemies or their allies.

4—An official or agent of an enemy Government or any subdivision thereof.

5—All natives, citizens, or subjects of Germany or Austria-Hungary interned by the War Department.

6—All citizens or subjects of Germany or Austria-Hungary resident outside of the United States who are (a) wives of officers, officials or agents of Germany or Austria-Hungary, wherever resident; (b) wives of persons within the territory (including that occupied by military and naval forces) of Germany or Austria-Hungary; or (c) wives of persons resident outside the United States and doing business within enemy territory.

7—Citizens or subjects of Germany or Austria-Hungary who are prisoners of war or who have been or shall be interned by any nation associated with the United States in the war.

8—Citizens or subjects of Germany or Austria-Hungary who since April 6th, 1917, have disseminated or shall hereafter disseminate propaganda to aid any enemy nation or to injure the cause of the United States, or who have assisted, or shall assist in plotting against the United States or any nation associated with the United States in the war.

9—Citizens or subjects of Germany or Austria-Hungary who are included or who shall be included in the "Enemy Trading List" published by the War Trade Board.

10—Citizens or subjects of Germany or Austria-Hungary who, at any time since Aug. 4, 1914, have been resident within enemy territory.

Numbers 2, 6, 8, 9 and 10 apply only to persons resident outside of the United States.

Three-quarters of a billion dollars' worth of property have been reported to the Alien Property Custodian at Washington already, but from an investigation throughout the country it is known that there is much more not yet located.

Every one can help the nation by mailing the Bureau of Investigation, Alien Property Custodian, Washington, D. C., reports or information on enemy-owned property in his vicinity.

AFTER the war there is no doubt that France will adopt a mixture of alcohol and benzol as the national motor fuel, particularly for commercial vehicles, agricultural tractors, etc., says the *Petroleum Review*. Alcohol as a motor fuel is no stranger to Frenchmen, and would have been adopted years ago but for the lack of a settled policy to prevent speculation and violent fluctuations in prices. Before the war there were no motor vehicles running entirely on alcohol. But for two years the Paris General Omnibus Company used a 50 per cent mixture of benzol and alcohol, and only abandoned it for benzol owing to the steady rise in the price of alcohol. It is the intention of the French Government to secure a monopoly of alcohol, and to encourage its use.

Exhaust Headers and Mufflers

An S. A. E. Paper Considering the Subject from the Standpoint of Aircraft Engineering—Present Practice Reviewed and Conclusions Drawn

By Archibald Black*

IN the following notes no attempt has been made to treat exhaustively the design of exhaust headers or mufflers for airplane engines. The paper is intended chiefly to record some data collected on this subject during the past several years.

The exhaust header's primary purpose is to carry exhaust gases away from the engine, but it may be designed to perform certain other functions to advantage. The most important of these is probably the muffling of the sound of the exhaust, which may be brought about by a properly designed header.

In present practice the exhaust is taken care of in several radically different ways, the devices of the different designers ranging from the open port to the elaborate combined header and muffler as now used on some machines.

Typical Constructions

Fig. 1 shows the open port, which was very popular on the old engines and was used until recently on the Curtiss 90-hp. JN-4 type engine. In that type no effort was made to carry away the gases or to muffle the noise. Fig. 2 shows the "stub tube" method, used on some Hall-Scott installations and recommended by the Hall-Scott Company for its engines. In this system each cylinder is furnished with an individual exhaust pipe several inches long, which points straight out from the engine and is cut off on the outer end at an angle of about 45 deg. to prevent the air from causing a back pressure when the airplane is moving. While this arrangement assists the cooling of the engine, it gives the maximum of noise and would appear therefore not entirely satisfactory for either military or sporting machines.

Fig. 3 illustrates what has come to be known by many as the German system on account of its origin on machines of that nation and apparent popularity among German designers. Tubes extend upward from each cylinder into the common header, which is of streamline section and points upward and slightly to the rear, directing the gases over the top of the upper wing. This reduces the noise heard from below and appears to be a very practicable, although not final, solution of the problem.

Fig. 4 shows an adaptation of the German system used on recent Curtiss JN-4 machines.

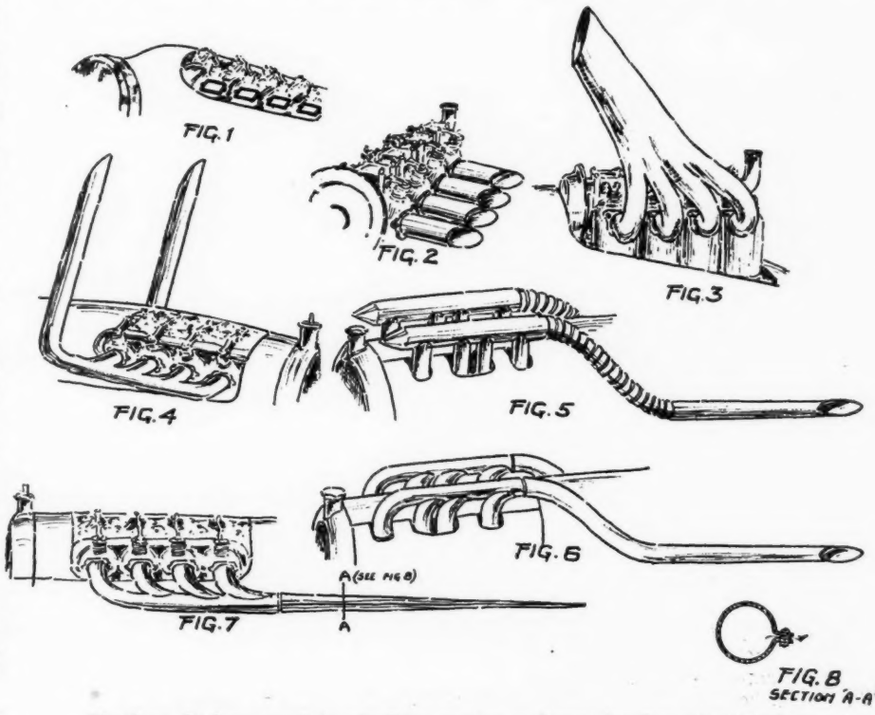
Fig. 5 is the original L-W-F header, consisting of short tubes run at right angles into a manifold tube, the front end being closed and the rear end connected by a flexible metallic tube to a straight pipe leading along the body to the rear of the pilot, the end being open to permit the escape of the gases. This design was discarded, after the first few machines, in favor of the method illustrated in Fig. 6. Here the individual pipes sweep backward on a liberal radius into the manifold, and the flexible pipe is replaced by a smooth steel tube, which is perfectly straight on some models, depending upon the engine used. Fig. 7 shows the new header and muffler as fitted to some of the Curtiss machines. This header connects to a tube, which extends backwards along the body and terminates in a muffler.

The muffler is simple and most ingeniously designed; the exhaust tube is slotted and the metal bent outward to form two parallel flanges separated by spacers as shown in Fig. 8. The author had no opportunity to examine the earlier of these mufflers, as installed on R-4 machines, but the following description was reported to him by the field department of the L-W-F Company. The slot was about 5 to 6 ft. long and about ⅛ in. wide, starting near the engine and running back to the end of the tube, which tapered from the full section of the engine to a comparatively small section, open to the atmosphere, at the rear end.

One of the Curtiss engineers stated that no material loss of power was found to be caused by the use of this muffler. It has been generally conceded by those who have heard the engine running with the muffler in place that the noise of the exhaust is reduced to much less than its former volume. This bears out the author's experience with similar devices installed on several engines; these are referred to later in this paper.

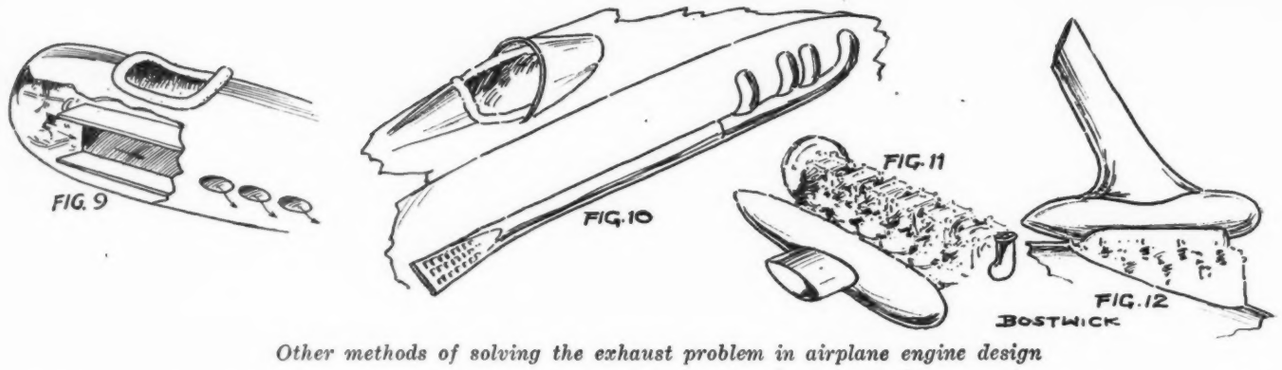
At a later date the author made an examination of a similar muffler installed on one of the Curtiss company's JN machines equipped with Hispano-Suiza engines. This muffler had no large opening in the rear, the slot extending around the end instead. The slot was about 4 ft. long and 1/16 in. wide, approximately an allowance of about 0.04 sq. in. of slot per b.hp.—an extremely small area.

Fig. 9 shows a method of muffling the exhaust gases devised by Deperdussin, the French constructor. This is shown as



Various designs used in airplane engine exhaust header construction

*Chief Engineer, L-W-F Engineering Company, Inc.



Other methods of solving the exhaust problem in airplane engine design

applied to an engine of the rotary type, the gases being carried through internal ducts to outlet holes at the rear of the body.

The French "Spad," Fig. 10, is furnished with exhaust headers extending backward for about 6 ft. from the engine. These headers are 3 in. inside diameter and terminate in a muffler consisting of a tube, round at the end, fastened to the exhaust header, which is flattened towards the rear, where it ends up about ½ in. in height and is considerably wider than the diameter of the front end. This rear end is closed except for four slots similar to those in top and bottom, described below.

In the flattened part, both on top and bottom sides, are a number of slots 1 in. long and ⅛ in. wide, with round ends. Each muffler has 78 such slots, giving a total area of 0.1267 sq. in. per brake horsepower for two such mufflers, based on 150 b.hp. (the rating of the Hispano-Suiza).

The exhaust pipe allows 0.08836 sq. in. cross-section per b.hp. and has considerable capacity due to its length. This capacity, by allowing expansion of gases, should assist the action of the muffler considerably. The above figures are exact measurements.

Fig. 11 shows the manifold used on later "Mercedes" engines. No detailed information on the construction of this manifold has been obtained by the author.

Fig. 12 illustrates a manifold used on Farman and Breguet machines, which appears to be similar in design to the "Mercedes" referred to above. The author has examined the Breguet manifold but could not obtain as much detailed information as desired. The inside apparently contains no baffle plates and the pipes from the cylinders enter tangentially to the body. This construction is evidently designed to reduce the velocity of the gases by causing them to expend their energy in eddy currents in the main chamber.

Fig. 13 is a scale drawing of one of the mufflers tested under direction of Prof. W. T. Fishleigh at the University of Michigan a few years ago. Five mufflers of different designs were experimented with and detail reports were published in *Horseless Age* in May, 1915. Of those tested, the muffler shown here was rated as the best in muffling ability and low back pressure, and one of the two best in low horsepower losses. This muffler was also the lightest of the five. Although the most efficient of those tested, it showed a b.hp. loss of 3.6 per cent with engine delivering 38 b.hp. This device weighed 14.5 lb. and had a capacity of 847 cu. in.

Fig. 14 is a scale drawing of one of the mufflers tested under the direction of Profs. H. Diedrichs and G. B. Upton of Cornell University. Details of the tests are given in the Second Annual Report of the United States Advisory Committee for Aeronautics. The results of tests of the particular muffler shown are given in part in Table I. It will be noted that this muffler caused a loss in horsepower of only 1.5 per cent, from which it would appear that it is efficient enough to justify its application in many cases to airplane engines.

Another type of muffler was experimented with recently by J. L. Cato of the L-W-F Company. This muffler was somewhat similar to the "Spad" device, but it had a slot in the end instead of being closed and was provided with small semicircular louvres in the side instead of slots. The areas allowed and the results obtained were in general very similar to those of the "Spad" muffler.

The two main considerations in the design of exhaust headers and mufflers are the elimination of back pressure and the reduction of noise, which two requirements are, unfortunately, generally incompatible in practice. It is a simple matter to design headers fulfilling one, but not both conditions. The combining of both calls for a careful study and proportioning of even the smallest features of the device.

Research work of the manufacturers of blowers and air moving machinery is of considerable help in this work. F. L. Busey conducted a series of experiments* to determine the effects of bends in air ducts. The curves published by him, combined here in Fig. 15, show that, when the radii are small, bends in square pipe offer more resistance than bends of the same radius in round pipe. The reverse is the case when the radii are large. This change of condition takes place when the radii equal about 0.6 times the diameter or side.

The American Blower Co. also has made some tests and publishes among its data sheets one giving the resistance of bends in terms of equivalent length of straight pipe.

It will be noted from Fig. 15 that the resistance of the bend is lowest when the radius is equal to 2½ times the diameter; that nothing is gained by making it greater than this; and that this resistance rises to a prohibitive value if the radius is less than 1 to 1½ times the diameter of the pipe. While this curve is based on tests which were made at lower speeds than are probably encountered in an exhaust manifold, Willis H. Carrier† concluded, from results of experiments, that losses in elbows through which air is flowing depend on the radius of curvature of the elbow and not on its size or on the velocity of the air.

It would therefore appear safe to assume that the curve given applies equally to the high velocity of flow in an exhaust manifold. Bends of high resistance in manifolds, if near the engine, will sometimes show up by becoming red hot. Sudden changes in the area of the exhaust pipe should be avoided. The areas of the individual exhaust pipes are usually fixed by the necessity of making their ends conform to the ports in the cylinders in order to obtain this condition. When this is not the governing condition, personal experience with different installations of headers and some investigation of

*Loss of Pressure Due to Elbows in the Transmission of Air Through Pipes or Ducts.—*Trans. American Society Heating and Ventilating Engineers*, 1913.

†*Fan Engineering*, 1914 Edition, page 114.

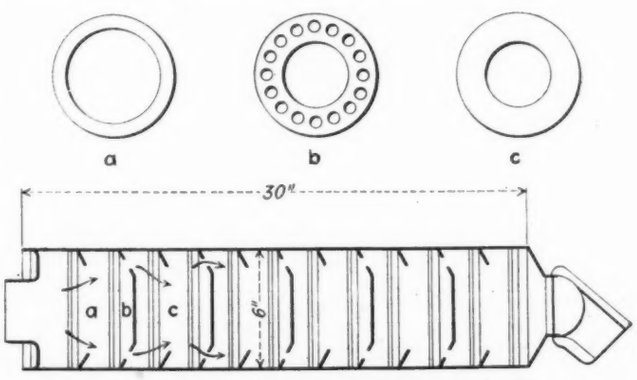


Fig. 13—Muffler design giving best results in test by Professor Fishleigh

the areas of exhaust ports on several successful aircraft engines suggests that 0.14 to 0.16 sq. in. of area per b.hp. of cylinder is a liberal allowance. The exhaust ports of the Hall-Scott A-5A, Thomas 8, Sturtevant 5A and Liberty, some of the engines studied, averaged 0.1668 sq. in. per b.hp. As large a radius as possible should be used in these tubes which enter the manifold. The latter should be of large sectional area at the outlet end, tapering down to equal the area of the individual pipe at the other end. Where a tube extension is used it should be as straight as possible and of the same sectional area as the manifold end.

The proper area for the large end of the manifold is best determined for the experiment with several different sizes, noting the effect upon the horsepower of the engine while running on the dynamometer. This best size will probably vary with different engines, being governed, no doubt, by piston speed and the shape of exhaust ports as well as by the brake horsepower of the engine. As these experiments, however, cannot always be made, the author recommends allowing about 0.07 sq. in. of area per b.hp., which figure is the average of the several American and foreign installations. When two headers are used—as on eight or twelve-cylinder engines—it should be kept in mind that each header handles only half of the total exhaust. For most engines this allowance will be found to be liberal.

Exhaust headers have been developed, by experiment, which have had areas as low as 0.045 sq. in. per b.hp., but it would not seem advisable in the absence of a series of experiments to attempt to reduce the figure given.

In cases where headers are inclined to overheat, it has been suggested that they be furnished with a series of longitudinal fins, welded to the tube, to increase the radiation. Automobile engines have been built which were equipped with headers having fins somewhat similar to these.

Table II gives the required outside diameter of No. 20 U. S. gage tube for various horsepowers, based upon the figure recommended above. This table, while giving satisfactory results, should not be considered final. It would be advisable to remove the manifold and note if there is any change in maximum speed of engine when running without it before the question is considered settled for the particular design.

Notes on Muffler Design

A very interesting and instructive treatise on the principles underlying the design of mufflers is found in part of the previously mentioned report of Profs. H. Diederichs and G. B. Upton.

Another interesting report of experiments, previously referred to, published in *Horseless Age*, contains conclusions from results and discussion of the principles of design.

The chief principle to be kept in mind in designing exhaust mufflers is the slowing down of the exhaust gases until their speed is below that of sound. This is accomplished by regular expansion, surface friction and the changing of the direction of flow. Most mufflers embody all three principles in greater or less degree.

It would appear to be a reasonably safe assumption that mufflers of the type shown in Fig. 14 may be designed for engines of any horsepower by making the areas of pipes and volumes of chambers proportional to the horsepower. The muffler shown is drawn to scale and was tested on an engine of 60 to 70 b.h.p.

The Curtiss type muffler seems to be one of the simplest and most effective devices in use, and some experiences of the author and his associates with mufflers of this type may be of interest. Experimental mufflers were designed along these lines, and were tested on engines of different makes. The noise of the exhaust was, in each case, reduced to very little more than the noise of an automobile truck engine of large power. Tests made with and without the muffler in place showed that no difference in the number of revolutions per minute could be detected with the tachometer while the engine was running at full speed. With the engine running at full speed one's hand could be held against the muffler slot without discomfort, in contrast to which it was noticeable that the heat of the gases became uncomfortably great when one's hand was held a couple of feet away from the end of the exhaust pipe without the muffler. The speed of the gases was reduced to a slight puff.

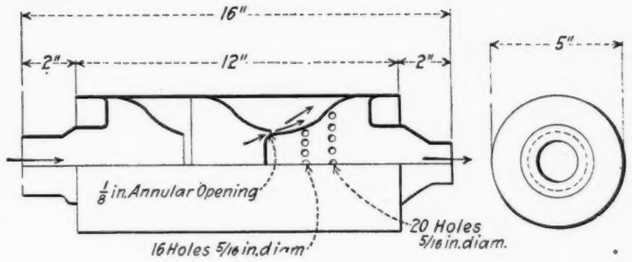


Fig. 14—Muffler used in tests results of which are given in Table I

Other work prevented the carrying on of further experiments, but the results appeared to suggest that the mufflers which were from 4 to 5 ft. long could have been reduced in length without loss in speed of engine or muffling effects.

While these mufflers were in use, several things were noted which called for attention. One engine was of the geared-down type, and when the muffler was in place the sound of the gears appeared to be of considerable volume, this noise being plainly heard above the sound of the exhaust. As these gears were lubricated by the engine oiling system, it would appear that some reduction of this noise could be obtained were the engine designed to permit lubricating them with a light grease instead of oil. It was also noted, with most of the engines, that once the exhaust was muffled, several other noises became apparent. These included the rattle of valve mechanism and noise of the propeller. In flight, while gliding with the engine running slowly, the "singing" of the wires was naturally more noticeable than before. The engines used in the above tests included a Sturtevant 140 b.hp. Hall-Scott Model A-5-A, Liberty 8 and Liberty 12.

No high degree of accuracy is claimed for the tests described, as they were field and not laboratory tests. The results indicated, however, that in design of mufflers of this type it is advisable that the slot be kept narrow (1/16 in. was found to be satisfactory), and that a net area of 0.05 to 0.06 sq. in. per b.hp. is ample. It did not appear to be necessary to leave any opening at the rear end as was done in the Curtiss R-4 muffler, better results in muffling having been obtained with the smallest end.

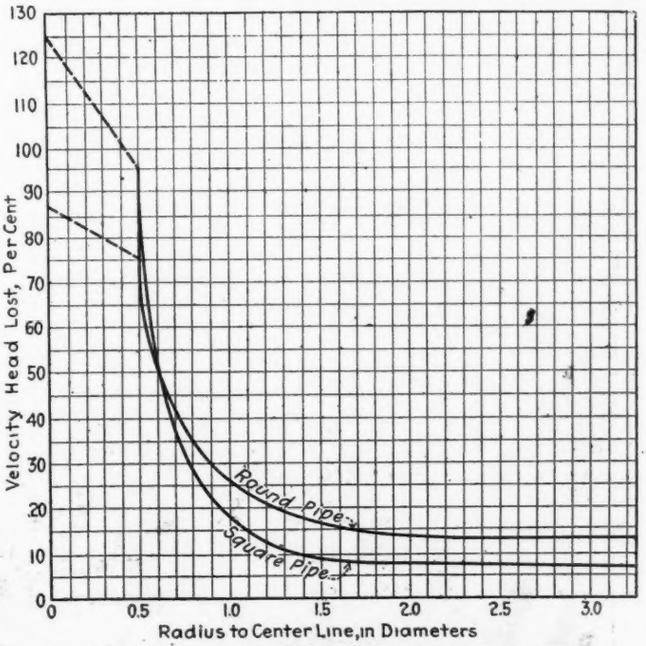


Fig. 15—Curves showing the effect of bends in air ducts

U. S. A. Ambulance and Trailer

A Review of the Specifications for an Ambulance Body for the Class AA or G. M. C. ¾-Ton Chassis—Details of the Spare-Parts Trailer and Field Litter

PRODUCTION has begun on a large order for ambulance bodies of a design developed by engineers connected with the Sanitary Corps. Deliveries of these bodies will begin in August and the full rate of production is expected to be reached in September. A definite order for five thousand has been placed with two companies and it is understood that the Medical Corps is at liberty to order 7000 more from the same companies. In addition to the ambulance body the engineers have also developed a spare parts trailer and a field litter, both to be attached to the ambulance.

In designing this new body, as in the design of other automotive apparatus at the present time, three prime considerations, each of vital importance, were considered: First, the use to which the vehicle will be put on the other side; second, the methods by which it can be manufactured on this side and finally, that its construction be such as to require minimum shipping space.

Standard Body Designed

The standard body is designed for application either on the ¾-ton G. M. C. chassis now used by the Medical Corps, or on the Class AA, U. S. A. military truck. The body will carry eight sitting patients and four lying. The design has been worked out so that two men can load the litters, instead of requiring three as is the case with the present type.

According to the specifications issued by the office of the Surgeon General, the design is intended to provide a strong substantial motor ambulance body, one that can be readily knocked down and assembled in the shortest possible length of time, consistent with boxing of disassembled body in the minimum size of shipping box. The floor, roof, side frames, and division panel, seats, deck frames, etc., are assembled as separate units, complete in themselves. The body is paneled with "vehisote," on the sides and at front division panels. The roof is made up of bows, or rafters, center rails, side rails and headers, and the whole is covered with "agasote." The edges of the roof are protected by sheet steel bent to angle form and screwed through agasote and side rails.

The aim has been to obtain complete interchangeability of parts so that the body can be shipped knocked down and assembled on the other side by comparatively unskilled men. The main parts, such as the sides, floor and roof will be fastened together by bolts and nuts. The body is strong enough to carry the weight of two wounded men at the top. Although intended for carrying wounded men, the vehicle can be used for Ordnance or Quartermaster service that would ordinarily be required of a ¾-ton truck.

The specifications provide that all parts must be constructed to definite standard dimensions, with proper tolerances, so that any of the parts can be replaced, properly fitted and adjusted without requiring additional tool or machine work. All drillings, borings and framings must be made in connection with forms, jigs and templates, in order to insure complete interchangeability. The general dimensions of the standard body are as follows:

Length of body over corner posts ..... 9 ft. 8 in.
Length of body from back of front division panel over rear post ..... 7 ft. 10¼ in.
Width inside ..... 4 ft. 8 in.
Front corner posts to center-line of wheel house, 6 ft. 5 in.
Height from top of floor to top of roof, at center outside ..... 5 ft. 0 in.
Height from top of floor to outside of edge of roof ..... 4 ft. 9½ in.

It will thus be seen that the body is roughly 10 ft. long, 5 ft. wide, and 5 ft. high. When these dimensions are compared with those of the packing box, which is 10 ft. 1¾ in. long, 5 ft. 1⅜ in. wide, and 2 ft. 2 in. high, the economy in shipping space can be appreciated.

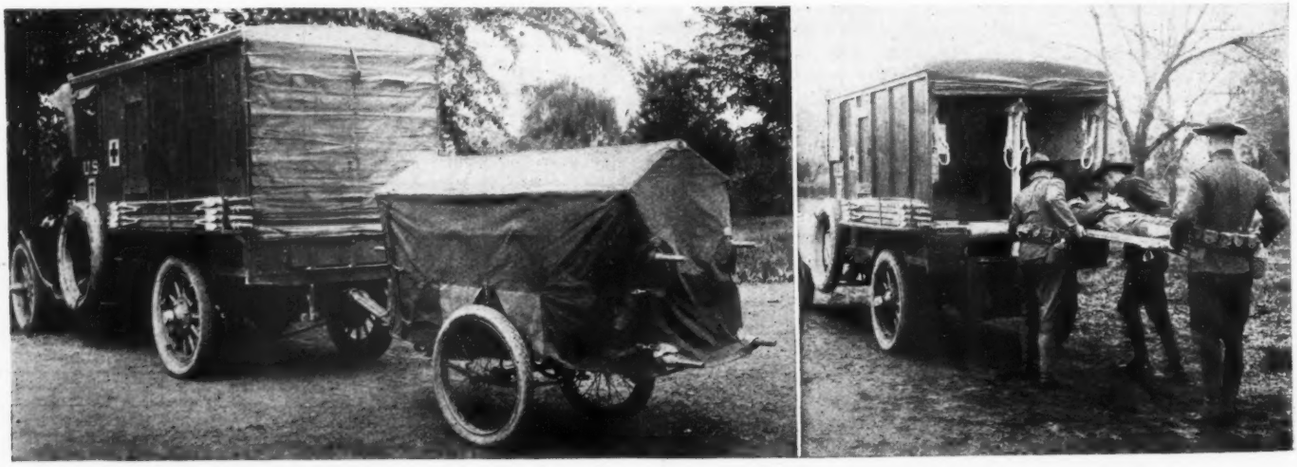
Chassis a Commercial Product

The ¾-ton chassis is practically a commercial product with a few changes made as required by the special service. The speed with the governor off is about 40 m.p.h.; with it on about 20 m.p.h.; a four-cylinder engine, giving 27.5 hp. at 1100 r.p.m., is used.

The spring design is especially interesting, since it is the result of a large number of tests of different types. Half-elliptic springs, silico-manganese, graphite-filled, are used, with a heavy type of recoil check or snubber applied to each spring.

The rear springs are 54 by 2½ in., with sixteen leaves. The flexibility is 275 lb. per inch, and the rated load 1350 lb.

The front springs, 38 by 2¼ in. have nine leaves. These



Left: Ambulance drawing litter carrier. Right: Loading the litter carrier on the top tier

are offset, the distance from the axle center to the rear eye being 20 in.; and 18 in. from that center to the front eye. The flexibility of the front springs is 515 lb. per inch and the rated load 900 lb.

The total weight of the ambulance ready for the road, without personnel, is about 4820 lb.; allowing for two drivers at 150 lb. each, eight patients at 200 lb. each, including their equipment, the maximum weight of the loaded ambulance is 6720 lb. The weight of the standard body is 1375 lb., and that of the chassis with driver's compartment is 2840 lb.; the remainder of the 6720-lb weight being accounted for by litters, water tanks and other special equipment.

The spare parts trailer is mounted on a ¾-ton commercial trailer, but the body is specially designed. The body frame work is of wood, which is covered with 20-gage sheet steel. One of these trailers will be provided for every twelve ambulances, so that enough parts can be carried to make emergency repairs on the road. The interior of the body is divided up into thirty drawers. A work bench can be opened out from the rear. A cover is arranged for the man working as shown in the accompanying illustration. Double doors are provided on each end and on each side, giving access to the sheet steel trays and drawers, which slide in and out on steel angle guides.

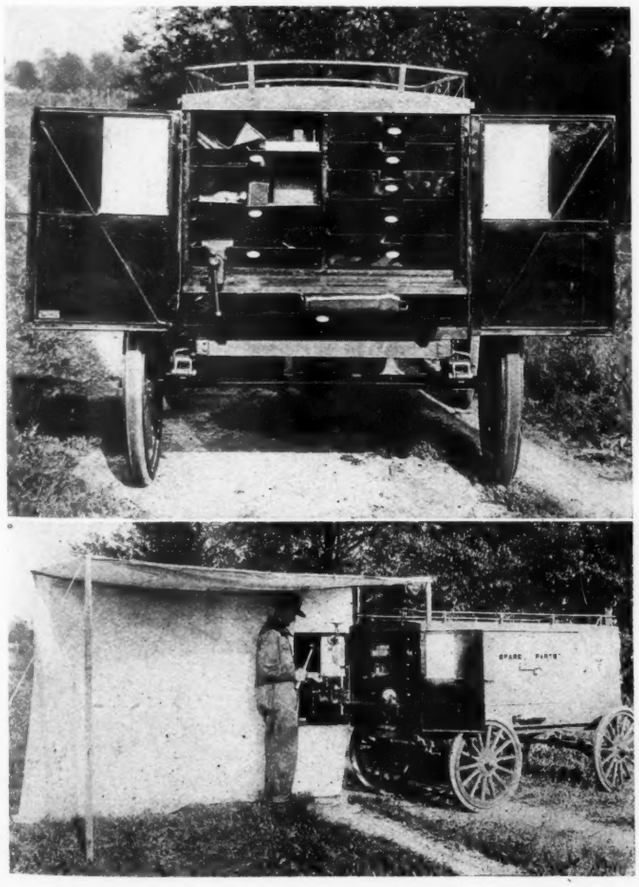
The general dimensions of the spare parts trailer bodies are as follows:

Length of body over all	94 in.
Width of body over all	42 in.
Height of body over all	36¼ in.
Length of lower floor boards	37 in.
Curvature of roof	1½ in.

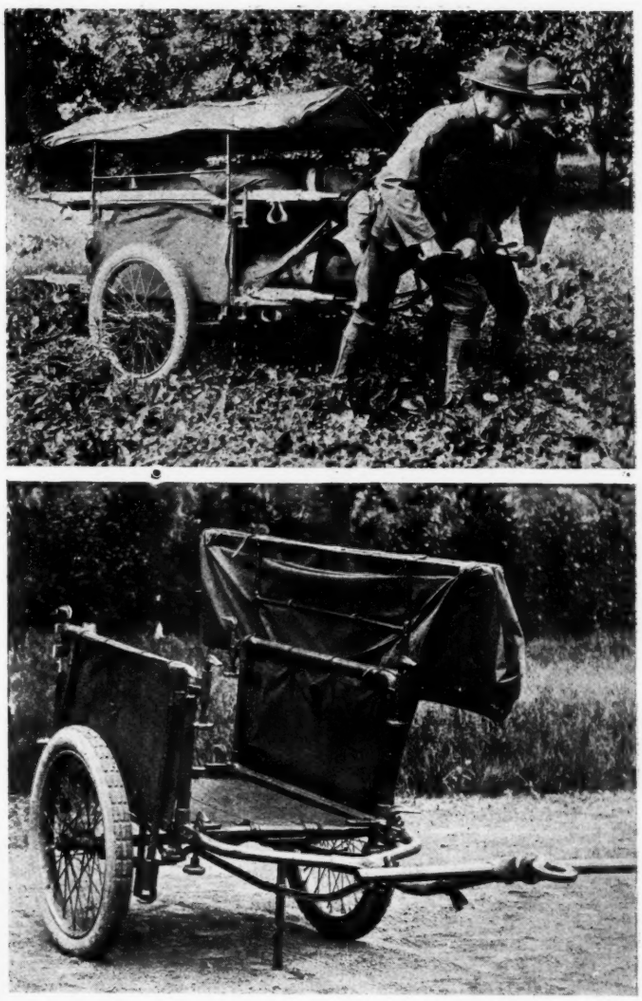
The field litter carrier has been designed by the Medical Corps engineers in this country. While the Allies have been using wheel carriers for wounded men, nothing like this has been developed. It is said this carrier will increase the efficiency of the Medical Corps stretcher-bearer 100 per cent. Two bearers can draw two wounded men in the litter carrier more easily than they carry one in the litter. The carrier can be hauled over very rough ground. It is designed so that it can be attached as a trailer to the ambulance, thus increasing the latter's capacity 50 per cent.

The two occupants can be completely covered by the curtain, or it can be lifted at the sides, or the top can be moved over to one side altogether.

About 150 carriers have already been ordered for overseas work and it is planned to supply one for every ambulance, except of course the vehicle in each company used for hauling the spare-parts trailer.



The upper picture is a rear view of the spare parts trailer. In the lower picture it is opened and in use as a workshop



Upper: Litter carrier in use carrying two men.
Lower: Details of the litter carrier's construction

—

THE standardization movement has extended to the manufacture of farm wagons. The National Implement & Vehicle Association through its Farm Wagon Department has issued a report on the standardization meeting recently held at Louisville, Ky. The manufacturers have agreed to eliminate a large number of types and sizes in farm, valley and mountain wagons. Five classes of vehicles have been decided upon. Sizes of tires for the various types of wagons have also been standardized and the total number of sizes has been materially reduced.

—

The popularity of the motor car in Canada, and particularly in the Province of Ontario, is evidently increasing steadily. At the present time there are 75,000 cars in that province, this number representing an increase of 25,000 since the beginning of last year. For 1918 the prospects appear to be excellent.

Safety Equipment for the Protection of Women Operatives

What Has Been Done in An Electrical Equipment Making Plant

The operative must use both hands to trip this punch press. When in use they are out of danger

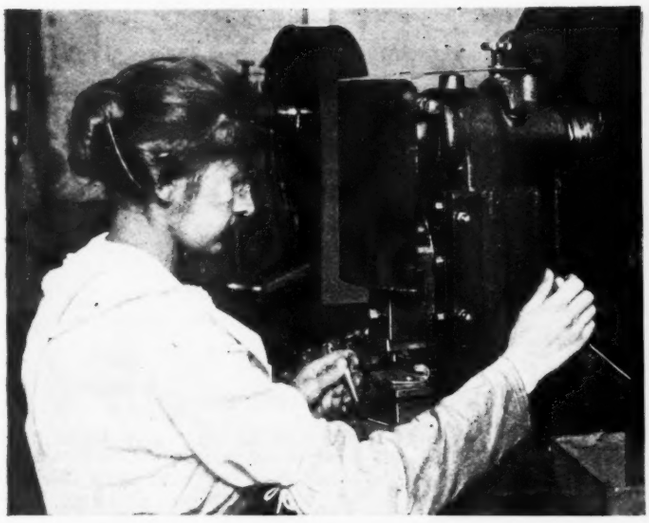
This mill cutter guard functions also to direct and confine the cutting lubricant

PROSPECTIVE employers of women as operatives on machine tools must give consideration to the safety problem from a viewpoint slightly different from that which only takes into account what is a sufficiently wide range of probabilities when male operatives are used. This is another way of saying that the woman as a machine operator presents certain problems for solution by the safety engineer which the man does not. She has, to begin with, in most cases, an absolute unfamiliarity with machinery of any kind, she has long, flying hair and she wears skirts.

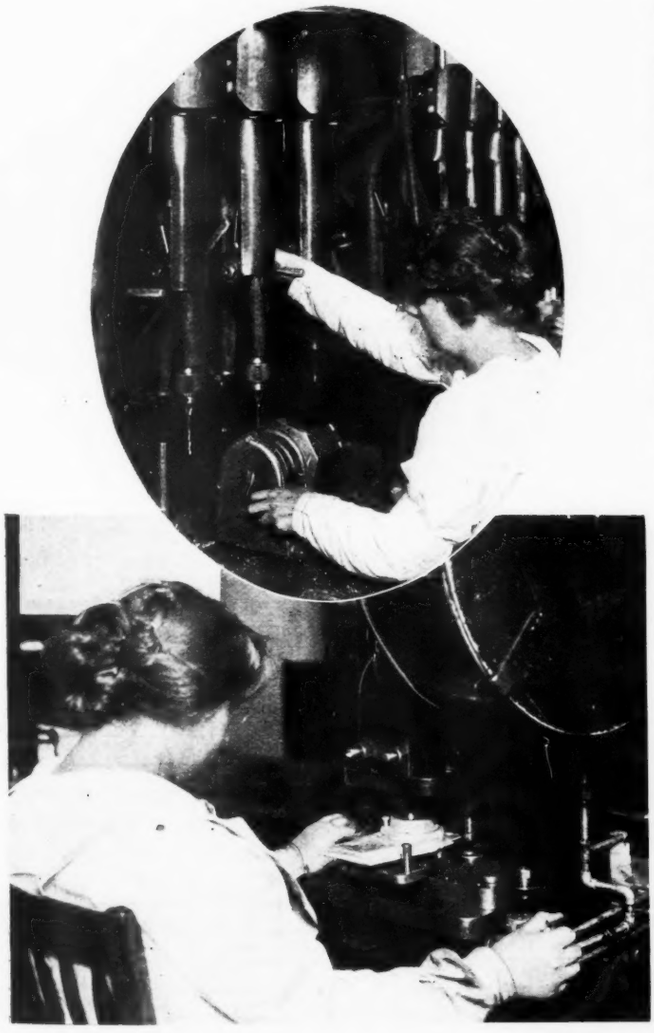
The hair and the skirt problems are being satisfactorily solved by the compulsory wearing of bloomers and caps. But the lack of familiarity with machinery and a more or less natural failure to comprehend the existence of danger where it really is—even though she often imagines it to be where it really isn't—are not counteracted by changing the character of her wearing apparel. Many safety engineers are convinced that a much more thorough safeguarding of machinery is necessary when women are to operate it. Others there are who hold that what is needed to make machinery safe for women is also necessary to make it safe for men.

The photographs reproduced on these two pages were made in the plant of the Dayton Engineering Laboratories Co., at Dayton, Ohio. The study of the problem of developing safety appliances for the machine which the women run in this plant has been most thorough and the installation of safety equipment has been most complete. A glance at the machines shown in the photographs will bear out this statement. The protection of moving parts of the machinery has been made so complete that it has not been found necessary or thought desirable to compel the women to wear caps to prevent their hair from flying

Boring drill guarded by extended sleeve which permits only point to project



Right—The swinging die in position. The operative uses one hand to trip the press and the other to hold the die in position. When both hands are in use, there is absolutely no danger of mashed fingers. Left—Loading a swinging die in position



Upper—Revolving parts of the drill press are covered with sheet metal guards as a means of absolute safety. Lower—The swinging die is shown here in position. Note the guarded flywheel

about and getting caught in revolving spindles or the like.

In the photograph of the women operating a multiple drill press, it will be noted that sheet metal guards have been installed to cover the spindles and even the belts and pulleys. In another photograph is illustrated the manner in which the flywheel of a punch press is entirely enclosed.

Swinging Dies Employed

For all press operations, it will be observed, swinging dies are employed which require that before a piece can be withdrawn from the die or another piece inserted the die must be swung out clear of the punch head and the danger of an accidental drop and resulting injury to a hand is automatically avoided. Furthermore, only such presses are employed as necessitate the use of both hands simultaneously for their operation.

The importance of accident prevention has evidently been given great weight in the Delco plant, which is as it should be. Like sanitation, fire protection and other preventive measures, it is difficult, if not impossible, to overdo it. What the law requires is usually a minimum and therefore not an altogether safe guide for any individual manufacturer who would safeguard his labor supply and maintain his lost time and turnover percentages at the lowest possible point.

Nine-Tenths of Accidents Preventable

It has been repeatedly pointed out and it cannot be repeated too often, that nearly 90 per cent of industrial accidents result from preventable causes. And of these, much the larger part are due to carelessness or apathy on the part of operatives and a lack of appreciation of danger. Much can be done, as has been done by the Delco company, to reduce the number and severity of accidents by the guarding of machinery, but it is also essential, experts agree, if maximum results are to be obtained, to secure the whole-hearted co-operation of the employees themselves. Where it is not practical to employ a safety engineer, whose exclusive business it is to see that safety measures are provided and educational work done among the workers, much good can be accomplished by a special safety committee of workers whose duty should be to study the causes of accidents, to suggest suitable means of prevention and to make frequent inspection of machinery and plant.

Predicting Strength and Efficiency of Airplane Propellers—II

By F. W. Caldwell

(*Concluded*)

The efficiency of the propeller can be computed by a method of trial as follows: First assume an efficiency of 80 per cent. The thrust will then be

$$T = \frac{0.80 \times 356 \times 550}{191} = 820 \qquad (6)$$

The slip-stream velocity can be computed from the impact formula (2), and then

$$v = \frac{T}{AV\frac{\rho}{g}} = \frac{820}{104 \times 191 \times 0.00238} = 17.3 \text{ f.p.s.} \qquad (7)$$

which means that the slip is 9 per cent.

From the Froude method the theoretical efficiency can be found as follows:

$$e_1 = \frac{V}{V + \frac{v}{2}} = \frac{191}{200} = 0.955 \qquad (8)$$

Analysis of Propeller Efficiency

Assuming that the section at 0.75 radius is representative of the propeller as a whole and that the value of L/D at this section is twenty, the efficiency by the aerofoil method can be obtained from the chart shown in Fig. 3. It is first necessary to find the corresponding value of ND/V, which is

$$\frac{ND}{V} = \frac{1400}{60} \times \frac{0.75 \times 11.5}{200} = 1.01 \qquad (9)$$

The aerofoil efficiency is found from Fig. 3 to be 85 per cent. The product of the two efficiencies (see equation 8) is $0.955 \times 0.85 = 81$ per cent. A further correction due to the spiral component of the slip-stream will reduce this to 80 per cent. Since the assumption made in computing the slip-stream velocity was correct it need not be recomputed.

The drag of the supporting surfaces at ground level and at a plane velocity of 191 f.p.s. will then be $3400 \div 12.3 = 276$ lb. The parasite resistance, that is to say, the propeller thrust minus the wing drag will be $820 - 276 = 544$ lb.

At 20,000 ft. altitude the air density can be taken as 50 per cent of the density at ground level. As a first approximation assume that the propeller speed will increase in proportion to the cube root of the horsepower (the horsepower being proportional to the engine speed, since constant torque is assumed), and in inverse proportion to the cube root of the density; then in level flight

$$N_1 = 23.3\sqrt[3]{\frac{N_1}{23.3} \times \frac{1}{0.5}} = 33 \text{ r.p.s.} = 1980 \text{ r.p.m.} \qquad (10)$$

Assuming a constant torque the engine will then deliver 503 hp. Assuming 80 per cent propeller efficiency

$$T = \frac{503 \times 0.80 \times 550}{V} = \frac{221{,}500}{V}$$

As a first approximation to determine K_x, assume the velocity to be proportional to the cube root of the horsepower delivered and inversely proportional to the cube root of the air density. Then

$$V = 191\sqrt[3]{\frac{1}{0.5} \times \frac{503}{356}} = 270 \text{ f.p.s.}$$

$$\text{and } K_y = \frac{3400}{420 \times 0.00119 \times 270^2} = 0.0933.$$

The corresponding K_y/K_x will be 12.3 and K_x will be 0.00759.

$$\text{Thrust} = \text{Total Drag} = \left(\frac{\rho}{g} K_x S V^2\right) + \left(\frac{0.5}{1} \times 544 \times \frac{1}{191^2}\right)$$

Since $\frac{\rho}{g} = 0.00119$ at 20,000 ft. altitude, we have

$$\frac{221{,}500}{V} = \left(0.00119 \times 0.00759 \times 420 + \frac{191^2}{0.5 \times 544}\right) V^2$$

Whence

$$V = 270 \text{ f.p.s.} = 184 \text{ m.p.h.}$$

Thus the assumption as to plane velocity are seen to be

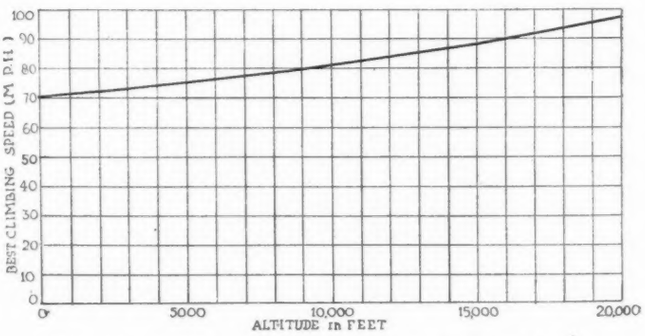


Fig. 15—For absolute value of key, L/D and wing drag are constant. Power absorbed by drag of wings will then be proportional to speed of plane

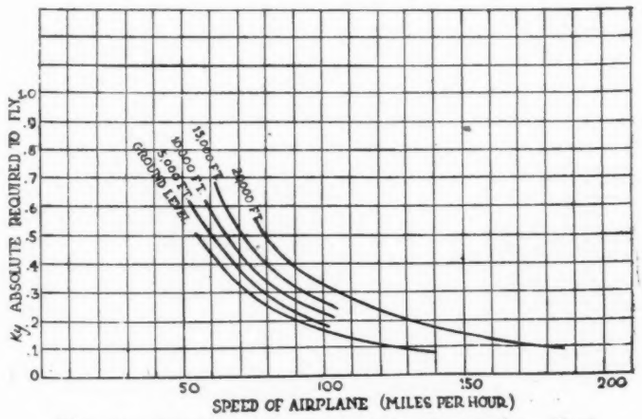


Fig. 16—Propeller for constant torque engine. Best climbing speed at ground level 70 m.p.h.

correct for constant torque, so that they need not be recomputed.

To find the propeller efficiency under the new condition the thrust is first computed from the formula

$$T = \frac{550 \text{ hp.} \times e}{V} = \frac{550 \times 503 \times 0.80}{270} = 820 \text{ lb.}$$

Again the slip-stream velocity will be

$$v = \frac{T}{AV\frac{\rho}{g}} = \frac{820}{104 \times 270 \times 0.00119} = 24.3 \text{ f.p.s.}$$

The theoretical efficiency will be

$$e = \frac{V}{V + \frac{v}{2}} = \frac{270}{270 + 12} = 0.958.$$

Since ND/V has the same value as before, the true angle of attack will be the same and the aerofoil efficiency will again be equal to 85 per cent.

The product of the two will as before be 81 per cent, and this will be reduced to 80 per cent by the correction for the spiral component of the slip-stream.

It is apparent therefore that the efficiency of the propeller is the same for the two flying conditions, provided the engine torque is kept constant.

These results can be deduced without making the calculations as follows: The total lift of the plane may be expressed as

$$W = \frac{g}{\rho} K_y S V^2$$

in which S is constant for all altitudes and W and g are approximately constant. In order to maintain a constant angle of attack K_y must be held constant, then ρV^2 is constant, and V is inversely proportional to the square root of the density. For this condition the total drag of the machine will remain constant and the horsepower required to drive the plane will be equal to the horsepower required at the ground level multiplied by the ratio of the plane velocity at altitude to the plane velocity at the ground.

If the speed of the propeller is kept proportional to the velocity of the plane, its ND and its V efficiency will be constant. To maintain this speed the engine horsepower must be proportional to the ratio of N^3 multiplied by the inverse ratio of the air densities. But since N^2 is proportional to V^2 it is also inversely proportional to the ratio of air densities. It is consequently necessary to maintain only the engine horsepower proportional to the speed. This is obviously the definition of an engine with constant torque.

The rate of climb to be expected from a plane fitted with a constant-torque engine is shown graphically in Fig. 13. (The calculations for rate of climb are given at the end of the paper.) If an adjustable-pitch propeller were applied to this engine, the propeller speed could be maintained at 1700 r.p.m. during the whole climb. The horsepower available and the rate of climb, Figs. 14 and 15, indicate such an improvement in the performance that the variable pitch feature becomes highly desirable.

Ceiling

Evidently the ceiling of such a plane is not limited by aerodynamical considerations, but only by the strength of the materials employed. The engine and propeller speed would continue to increase until something let go. The limiting speed of a propeller of this size would probably be about 2500 r.p.m. in thin air with the materials now in use. This would correspond to an air density equal to 31 per cent of that at the ground, and at an altitude of about 34,000 ft. In flying at greater heights it would be necessary to throttle the engine in order not to over-stress the propeller, so that the ceiling would be in the neighborhood of 45,000 ft.

In conclusion I wish to emphasize the fact that the variable-pitch propeller is, to a certain extent, limited to special cases. The design of a propeller for an engine with constant torque presents no difficulty, except that the climbing rate near the ground must be reduced, owing to the slow speed of the engine. This is not serious and can be entirely overcome by the use of a variable-pitch propeller. The interesting feature of this development is the great speed to be expected. It is not out of the question to attain speeds of 200 m.p.h. at an altitude of 30,000 ft.

Conventional Design Compared to Adjustable Pitch Propeller

The following assumptions will be made in calculating the climbing rate with a fixed blade propeller.

1. Engine output = 170 hp.
2. Propeller diameter = 8 ft. and $(A) = 50.3$ sq. ft.
3. Radiator area = 3.3 sq. ft. Effective area = 50.3 — 3.3 = 47.
4. Velocity of airplane = 120 m.p.h. = 176 f.p.s.
5. Engine speed = 1600 r.p.m. = 26.7 r.p.s.

The calculations are as follows:

In order to compute the thrust assume a propeller efficiency of 79 per cent.

$$\text{Thrust} = \frac{550 \times \text{hp.} \times e}{V} = \frac{550 \times 170 \times 0.79}{176} = 420 \text{ lb.}$$

$$\text{Velocity of slip stream, } v = \frac{T}{AV\frac{\rho}{g}}$$

$$= \frac{420}{47 \times 176 \times 0.00238} = 21.4.$$

$$\text{Slip} = \frac{v}{V} = \frac{21.4}{176} = 12.2\%.$$

$$\text{Theoretical efficiency (Froude method) } e = \frac{V}{V + \frac{v}{2}}$$

$$= \frac{176}{186.7} = 94.2\%.$$

$$\text{True } P_e = \frac{186.7}{26.7} = 7.00 \text{ ft.}$$

We must now determine the value of $\frac{ND}{V}$ and in doing this it may be assumed that the section at 0.75 radius is representative of the propeller as a whole.

$$\frac{0.75ND}{V + \frac{v}{2}} = \frac{0.75 \times 1 \times 0.8}{7.00} = 0.858.$$

Assuming $K_y/K_x = 20$, $e_2 = 86.5$.

Then true $e = 0.942 \times 0.865 = 0.815$.

which is reduced to 80 per cent by the spiral component of the slip stream. (The assumption of 79 per cent in computing thrust is nearly enough correct so that it need not be recomputed.)

$$\text{The effective pitch angle } \phi = \frac{0.75\pi ND}{V + \frac{V}{2}} = 20.3 \text{ deg.}$$

Assume that the true angle of attack from chord is 0.5 deg. and that blade angle $(\theta) = 20.8$ deg.

$$\text{Output} = 0.80 \times 170 = 136 \text{ hp.}$$

Calculation of Propeller Efficiency Under Climbing Conditions

Assume climb at 65 m.p.h. = 95.9 f.p.s.

The speed in climbing = 1475 r.p.m. = 95.4 f.p.s.

Assume efficiency = 60 per cent.

$$\text{Thrust} = \frac{0.60 \times 550 \times 1475 \times 170}{95.4 \times 1600} = 542 \text{ lb.}$$

$$v = \frac{542}{47 \times 95.4 \times 0.00237} = 50.9.$$

$$\text{Slip} = \frac{50.9}{95.4} = 53.4\%.$$

$$e_1 = 100\frac{V}{V+\frac{v}{2}} = 100 \times \frac{95.4}{120.8} = 79\%.$$

$$\frac{0.75ND}{V} = \frac{0.75 \times 1475 \times 8}{60 \times 120.8} = 1.22.$$

Effective pitch angle $\phi = 14.5$ deg.
Angle of attack = blade angle — effective pitch angle

$$\frac{K_y}{K_x} = 20.8 - 14.5 = 6.3.$$

From Fig. 3, $e_2 = 79\%$.

$e = 0.79 \times 0.79 = 62.3\%$. This is reduced by the spiral component of slip stream to 60 per cent.

$$\text{Output} = \frac{0.60 \times 1475 \times 170}{1600} = 94 \text{ hp.}$$

Before going further to determine the climbing rate let us obtain figures similar to the above for an adjustable pitch propeller. For this assume that
Speed = 1970 r.p.m. during climbing.

$$\text{Output} = \frac{1970 \times 170}{1600} = 209 \text{ hp.}$$

Efficiency = 55%.
Air speed = 65 m.p.h. = 95.4 f.p.s.

$$\text{Thrust} = \frac{0.55 \times 550 \times 209}{95.4} = 655 \text{ lb.}$$

$$v = \frac{665}{47 \times 95.4 \times 0.00238} = 62.5 \text{ f.p.s.}$$

$$\text{Slip} = \frac{62.5}{95.4} = 65.5\%.$$

$$e_1 = \frac{V}{V+\frac{v}{2}} = \frac{95.4}{126.7} = 75.3\%.$$

assuming $\frac{K_y}{K_x} = 20$,

$$\frac{0.75ND}{V} = \frac{0.75 \times 1970 \times 8}{60 \times 126.7} = 1.55.$$

$e = 0.86 \times 0.753 = 64.7$ per cent, which is reduced by spiral component of slip stream to be 59 per cent.
Output = $0.59 \times 209 = 123$ hp.

Comparison of Climbing Rates

Assume
Weight = 1400 lb.
Power required to fly at 65 m.p.h. = 35 hp.

With the Fixed Pitch Propeller

Excess power for climbing = 94 — 35 = 59 hp.

Rate of climb is $\frac{59 \times 33{,}000}{1400} = 1390$ f.p.m.

With Adjustable Pitch Propeller

Excess power for climbing, 123 — 35 = 88 hp.

Rate of climb is $\frac{88 \times 33{,}000}{1400} = 2070$ f.p.m.

Gain in rate of climb = 49%.
The increasing speed of engine during climbing will have the tendency to overspeed the power plant while climbing and to allow the speed to become normal in level flight. The desirability of this feature is still open to question.

Calculations of Efficiency During Climbing

The following calculations apply to an adjustable pitch propeller on a constant torque engine:
(1) *At ground level:*

$$\frac{\sigma}{g} = 0.00238 \qquad A = 104 \text{ sq. ft.}$$

$V = 103$ f.p.s. Engine output, 445 hp. at 1700 r.p.m.
Assume efficiency = 55%.

$$T = \frac{0.55 \times 445 \times 550}{103} = 1310 \text{ lb.}$$

$$v = \frac{1310}{0.00238 \times 104 \times 103} = 51.4 \text{ f.p.s.}$$

$$e_1 = \frac{V}{V+\frac{v}{2}} = \frac{103}{128.7} = 0.80.$$

$$\frac{ND}{V} = \frac{1700 \times 11.5 \times 0.75}{60 \times 138.6} = 1.764.$$

$$\frac{K_y}{K_x} = 16$$

then from Fig. 3, $e_2 = 0.720$.
$e = 0.720 \times 0.80 = 0.576$, which is reduced by the spiral component of the slip stream to be 53 per cent.
Output (useful) = $445 \times 0.53 = 236$ *hp.*
(2) *At 10,000 ft. altitude*

$$\frac{\sigma}{g} = 0.00178 \qquad A = 104 \text{ sq. ft.}$$

$V = 118.7$ f.p.s. See Fig. 15.
Output = 445 hp. at 1700 r.p.m.
Assume efficiency = 56%.

$$T = \frac{0.56 \times 445 \times 550}{118.7} = 1155 \text{ lb.}$$

$$v = \frac{1155}{0.00178 \times 104.7 \times 118.7} = 52.5 \text{ f.p.s.}$$

$$e_1 = \frac{V}{V+\frac{v}{2}} = \frac{118.7}{145} = 0.819$$

$$\frac{ND}{V} = \frac{1700 \times 11.5 \times 0.75}{60 \times 153.9} = 1.59$$

$$\frac{K_y}{K_x} = 16. \quad e_2 \text{ (from Fig. 3)} = 0.74.$$

$e_1 = 0.819 \times 0.74 = 60.5$ per cent, which is reduced by spiral component of slip stream to be 57 per cent.
Output (useful) = $445 \times 0.57 = 254$ hp.
(3) *At 20,000 ft. altitude.*

$$\frac{\rho}{g} = 0.00119. \qquad A = 104 \text{ sq. ft.}$$

$V = 144$ f.p.s. See Fig. 15.
Output = 445 hp. at 1700 r.p.m.
Assume efficiency = 62%.

$$T = \frac{0.62 \times 445 \times 550}{144} = 1055 \text{ lb.}$$

$$v = \frac{1055}{0.00119 \times 104 \times 144} = 61.7 \text{ f.p.s.}$$

$$e_1 = \frac{V}{V+\frac{v}{2}} = \frac{144}{175} = 0.823.$$

$$\frac{ND}{V} = \frac{1700 \times 11.5 \times 0.75}{185 \times 60} = 1.32.$$

$$\frac{K_y}{K_x} = 16. \quad e_2 \text{ (from Fig. 3)} = 0.74.$$

$e_1 = 0.79 \times 0.823 = 65$ per cent, which is reduced by spiral component of slip stream to 62 per cent.
Output (useful) = $445 \times 0.62 = 276$ hp.

Engine with Constant Torque

Calculation of K_y necessary to maintain flight at different speeds and altitudes.
Table showing values of K_y.

$\rho/gK_ySV^2 = 3400$. $S = 420$,
whence

$$K_y = \frac{8.1}{\frac{\rho}{g} \times V^2}$$

To obtain rate of climb, the thrust and the wing drag can be computed. The difference between thrust and wing drag at maximum speed will be the parasite resistance. The parasite resistance for other speeds can be figured from the ratio of the cube of the velocities, and the wing drag by the usual method. From the sum of these two the power required to fly can be computed and when this is subtracted from the useful power delivered the excess horsepower and consequently the rate of climb can be figured.

For 130 m.p.h., assume $K_y = 0.0935$. $\frac{K_y}{K_x} = 12.3$.

$$\text{Wing drag} = W \Big/ \frac{L}{D} = \frac{3400}{12.3} = 276.$$

Power delivered to plane $= 0.80 \times 356 = 285$ hp.

$$\text{Wing drag} = 276 \times \frac{191.5}{550} = 96 \text{ hp.}$$

Assuming engine speed of 1150 r.p.m. at the ground, in climbing at 70 m.p.h. the engine will give 293 hp. Assuming 58 per cent propeller efficiency, the thrust will be
$\frac{0.58 \times 293 \times 550}{103} = 911$ lb., and

$$v = \frac{911}{0.00237 \times 104 \times 103} = 35.8 \text{ f.p.s.}$$

$$e_1 = \frac{V}{V + \frac{v}{2}} = \frac{103}{120.9} = 0.853.$$

$$\frac{ND}{V} = \frac{1150 \times 11.5 \times 75}{60 \times 120.9} = 1.38.$$

Assuming a $\frac{K_y}{K_x}$ of 13 for this condition, the aerofoil efficiency will be 60 per cent, and
$e = 0.67 \times 0.853 = 57\%$.

The figures used in plotting the curves in Fig. 1 are:
V = Velocity of plane, ft. per sec.
v = Velocity of slip stream, ft. per sec. $= 0.15V$.
D = Diameter of propeller, ft.
D_1 = Equivalent propeller diameter $= 0.580D$.
The following calculations are used only to compute the power absorbed:
b = Max. blade width, ft.
b_1 = Weighted average blade width $= 0.75b$.
ρ/g = Air density $= 0.00237$.
e = Efficiency of propeller.

$$T = \text{Thrust} = \frac{\text{Hp.} \times e \times 550}{V}$$

$\rho/g \times K_y = 6.3 \times 10 - 4$.

$\frac{K_x}{K_y} = 20$ (assumed).

f = Factor for power absorbed by blade.
Aspect ratio assumed as 6. Number of blades = 2.

Fastor for blade shape $\begin{cases} = C \\ = 0.95 \end{cases}$

Note that the blade form used is not the same as Fig. 2.

Effective disk area $(A) = (D^2 - 0.05D^2) \frac{\pi}{4} = 0.95 \frac{\pi}{4D^2}$.

$$v = \frac{T}{\beta/g \times A \times V}$$

$$0.95 \times \frac{\pi}{4} \times D^2 \times V \times v \times \beta/g = \frac{\text{Hp.} \times e \times 550}{V}$$

$$D = 1437.5 \sqrt{\frac{\text{Hp.}\ e}{V^3}}$$

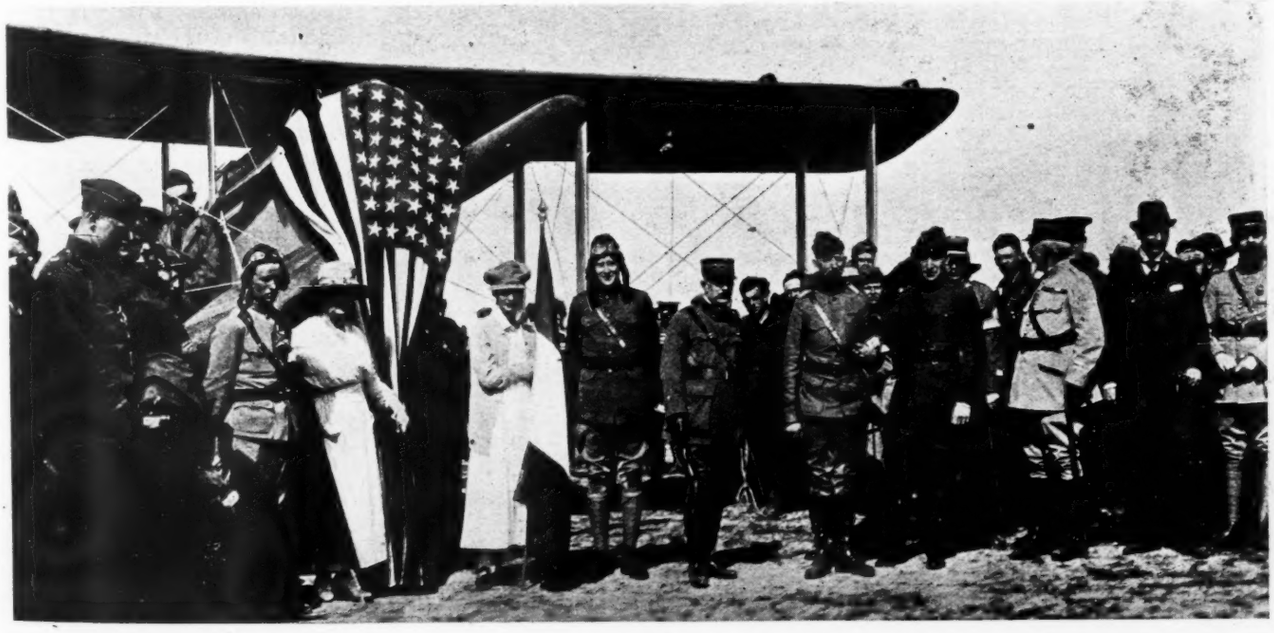
The following are used only in the derivation of the chart in Fig. 1:

$$C \times 2 \times \rho/gK_y \times b_1 \times R \times V^2 \times f = \text{Hp.} \times 550.$$

$$f = \frac{8800 \text{ Hp.}}{\rho/gK_y \times D^2 V^3 \times C}$$

$$\cot \varphi = \frac{2\pi R N}{V} \quad (At \text{ any radius } R).$$

$$\frac{N D_1}{V} = \frac{\cot \varphi}{\pi} \qquad \text{R.P.M.} = \frac{32.9\ V \cot \varphi}{D}$$



The first flight of a Liberty plane in France. Representatives of the Allied countries and welfare workers were present at the christening before the flight

Converting an Automobile Assembly Room for Shell Manufacturing

Use of 3-In. Pipe and Wooden Beams Solves Problem of Hanging Line Shafting in Sawtooth Assembly Room—How Car and Shell Making Run Parallel Through the Same Shop

WHILE the making of shell in a plant designed for the manufacture of automobiles calls for the solution of certain minor problems of equipment, it also develops the fact that in many ways the car-producing establishment is admirably fitted for this kind of work.

The government has found that the 155 millimeter trench mortar shell lends itself particularly well to the manufacturing facilities of automobile plants, and there are certain representative concerns which are rapidly getting into production on this kind of work.

The conversion from automobile manufacture to shell manufacture, however, calls for some radical changes in the equipment, and it is interesting to note how these changes may be made with the least possible expense and the greatest possible efficiency.

The progressive assembly floor of a manufacturing concern is the part of the shop generally turned over for this work. As a rule the requirements of progressive production call for a long and often narrow room, which also works out very well for shell manufacture.

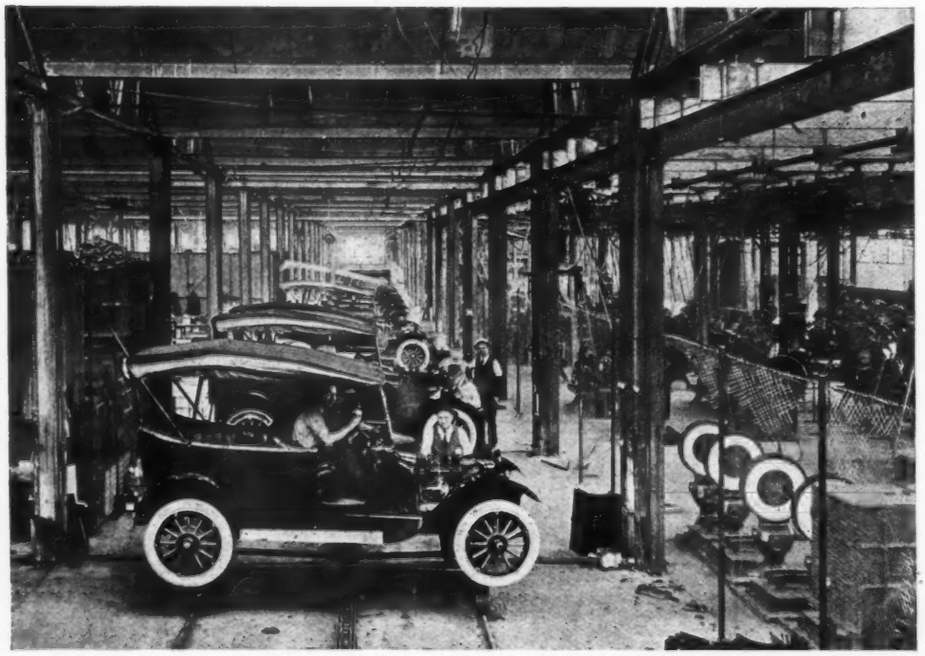
The first principle which should be observed is that the shell manufacture should be divorced absolutely from that of automobile manufacture. The two departments should be distinctively separate, and each should stand alone without dependence upon any units in the other departments.

The illustrations herewith depict the manner in which a long assembly floor in an automobile factory, with an output of about thirty cars per day, was divided so as to allow car manufacture to go on to a curtailed extent and at the same time provide an ideal layout for the manufacture of the 155-millimeter trench mortar shell.

The building, which is 750 ft. long and 40 ft. wide, was divided longitudinally approximately in the center by a wire fence which prevented passage between the two departments. This is clearly shown in the accompanying illustration, where car manufacture will be noted as proceeding on one side and shell manufacture on the other.

As no line shafting is to be found in the assembly department of an automobile plant, it was necessary to install the line shafting in a building which had not primarily been designed for it. The building itself is of structural steel type, being the modern sawtooth style.

It was necessary, therefore, when installing the line shafting, to increase the overhead supporting strength of the structure. This was done by means of the wooden beams which are clearly indicated in one of the photographs illustrating this article.

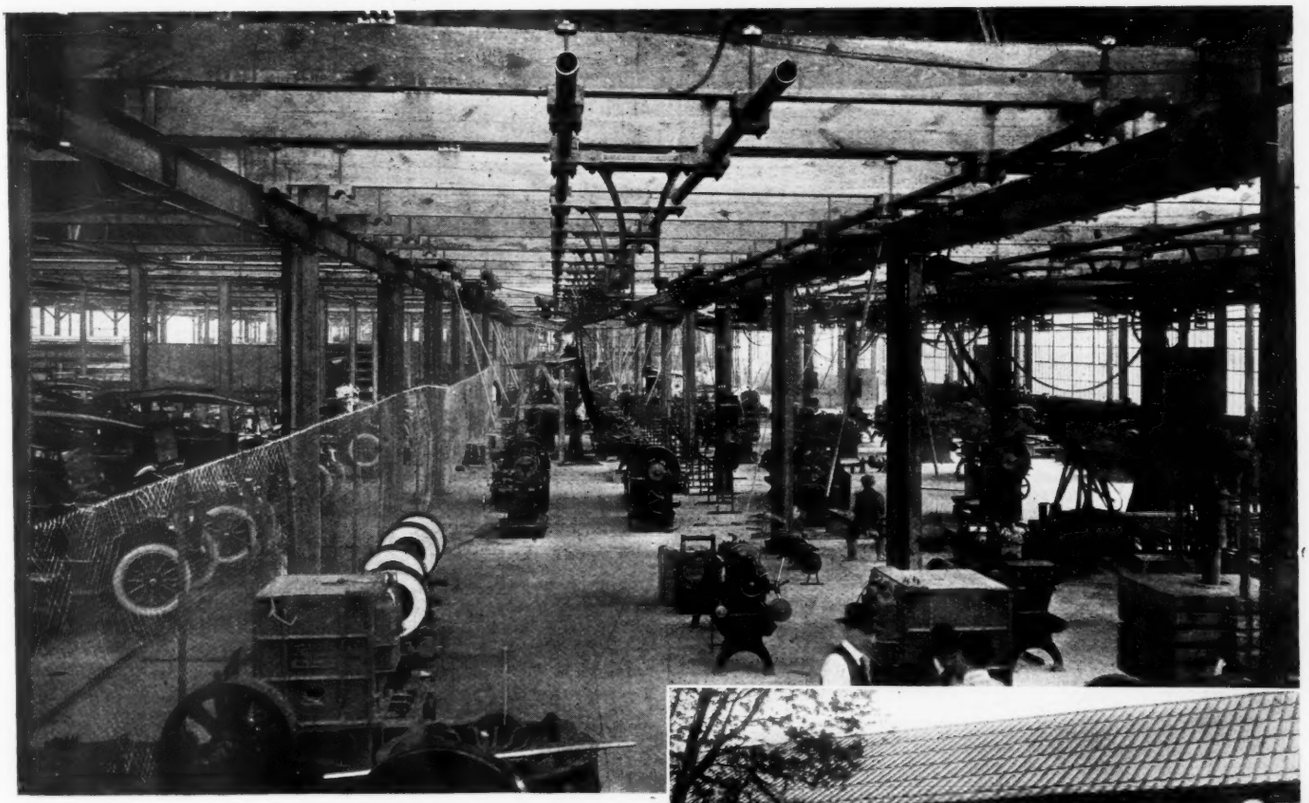


On the automobile side of the wire fence the cars come along the assembly chain on one side. The shell making machinery is on the other side

The line shafting supports were built up of 3-in. pipe, clamped over the wooden beams in such a way that they could be readily moved if necessary.

The castings supporting the line shaft bearings are supported from this pipe in a very satisfactory manner, giving an installation which is exceptionally flexible.

The electric motors for the shaft drive are also supported overhead from the I-beam, which forms a part of the permanent structure of the building. At the point where these motors are hung the additional live load is compensated for by the installation of an upright of wood placed be-

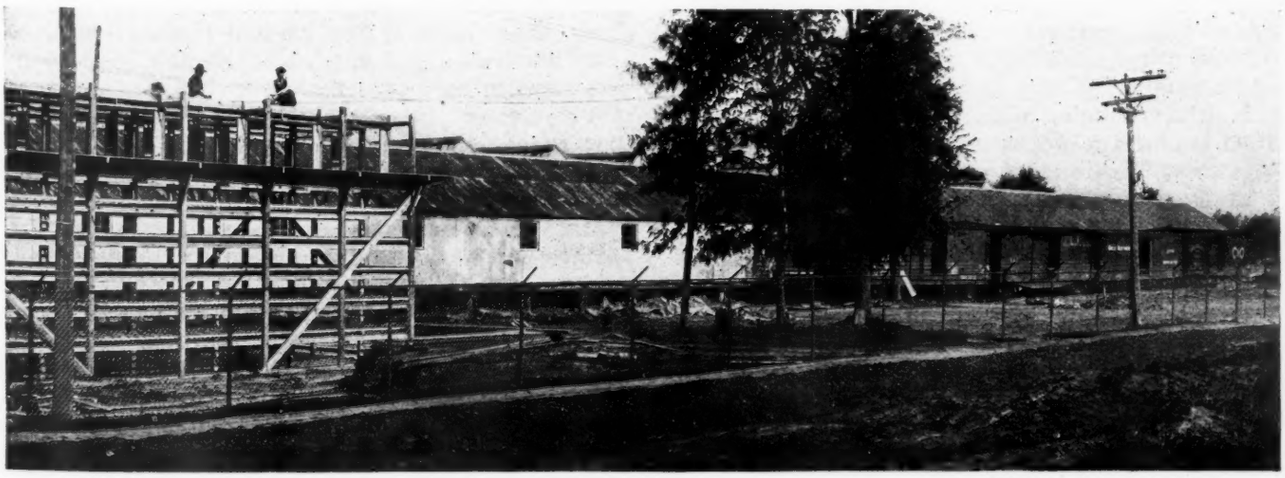


Showing how the munition manufacturing plant was divided from the automobile manufacturing plant by the wire fence down the center of the building

neath the I-beam. This upright not only supports the load of the electric motors, but also acts as additional support to take the stresses imparted by the line shafting.

With this arrangement, the shell manufacture and the motor car manufacture run parallel. The raw stock for both products starts from the same end of the building, one on one side and the other on the opposite side. An illustration which shows this is given in the accompanying view, in which the shell blanks can be seen piled up on one side and the frame stock for automobiles on the other side.

The receiving end of the plant. At the left are the cylindrical forgings, which are the shell blanks. These are printed by the United States Government. At the right are frames ready to be taken down the assembly chains to the automobile department



Converting a loading platform into a bonded warehouse

AUTOMOTIVE INDUSTRIES
The Automobile

PUBLISHED WEEKLY

VOL. XXXIX Thursday, July 25, 1918 No. 4

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
U. P. C. Building, 231-241 West 39th Street, New York City

BUSINESS DEPARTMENT
Harry Tipper, Manager

EDITORIAL
David Beecroft, Directing Editor
A. Ludlow Clayden P. M. Heldt
Sydney Oxberry
DETROIT OFFICE J. Edward Schipper
WASHINGTON OFFICE Allen Sinsheimer

BRANCH OFFICES
Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
Detroit—95 Fort Street, West, Phone Main 1351
Cleveland— Guardian Bldg., Phone Main 1142.

Cable Address - Autoland, New York
Long Distance Telephone - 8760 Bryant, New York

SUBSCRIPTION RATES

United States and Mexico	One Year,	$3.00
Canada	One Year,	5.00
Foreign Countries	One Year,	6.00

To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter.

HORSELESS AGE SUBSCRIBERS
Subscriptions for the Horseless Age transferred to the subscription list of AUTOMOTIVE INDUSTRIES in the merging of the two publications will be completed in full by the weekly issues of AUTOMOTIVE INDUSTRIES to the dates of expiration shown on the records of the Horseless Age Co.

Owned by United Publishers Corporation, Address 243 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; W. H. Taylor, Treasurer; A. C. Pearson, Secretary.

Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of the Audit Bureau of Circulations.

Automotive Industries-The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Aircraft Co-operation

FOR some months it has been a matter of wonder why those concerns engaged in the manufacture of Liberty aircraft engines should not have co-operated much more than they have, particularly when engine production has fallen more than 100 days behind the schedule and is continuing to fall behind. There is nothing that speeds up production like co-operation. We do not know of a single case where all of the factories engaged on the manufacture of Liberty engines and parts have been called together to discuss ways and means for stimulating production. There have been get-together meetings of the engineers, but not of the factory heads.

It was expected that when John D. Ryan took control, the sole reason or his taking it being that production must be speeded up, he would get all of the makers together and hold conferences on ways and means for accelerating production. So far, we know of no such conference having been held.

When Charles M. Schwab assumed control of production for Emergency Ship Building Fleet he immediately got all of the ship builders working in his field together. It was not one conference but several. He was appointed to increase production and he set about on the co-operative basis to do it. Not only did he get the heads of the ship building yards together but he went further and talked co-operation with the workers. With Schwab there was only one avenue for increased production and that lay through greater co-operation, greater co-operation of worker with worker, greater co-operation of worker with employee and vice versa, and greater co-operation among the builders.

Cannot a chapter be taken from production in the Shipping Board and applied to advantage to our present aircraft situation?

Factories engaged in manufacturing aircraft engines should bear in mind that their individualities and local prejudices must not stand in the path of production as they might in peace days. These factories are a portion of our fighting army. Co-operation in all our army activities is the fundamental of success. Burying individual whims is innate in military training. The same must apply to our factories, which when engaged in this war work are not individual enterprises in the sense they were in peace days. In peace days a production delay was a factory expense but to-day that same delay is an international affair, a matter of world concern.

Quenching Media

ONE of the arts that should be greatly advanced by activities in connection with the war is that of heat treatment of steel. Many of the parts entering into ordnance material require special heat treatment, and airplane engines also embody many hardened steel parts. The requirements of the automobile industry already have led to a great increase in the demand for heat-treating equipment and materials, and the conversion of automobile factories to shell manufacture and airplane engine manufacture will not check this growth. As a result of the increased demand for heat-treating equipment and material, considerable research work is being done along these lines at the present time. This was aptly illustrated by a paper on "Oils for Quenching" presented to the American Drop Forgers' Association by George Pressell. It appears from this paper that practically every known oil has been investigated as to its cooling properties and its permanency when used for quenching.

Many different qualities are required in steel for various purposes, and different quenching media are used to obtain different qualities. Water being a simple chemical compound, is not subject to chemical change at the high temperature to which the medium is raised by the red hot steel that is plunged into it. Oils, on the other hand, are of rather complex composition and when raised to a high temperature are subject to oxidation and chemical changes. Only certain constituents of the oil oxidize and precipitate out, and the remainder then

changes in its physical properties. As a rule it becomes more viscous and less capable of carrying off the heat from the steel quickly.

While viscosity is thus one of the qualities affecting the value of a quenching medium, another important factor is the temperature of vaporization. If this is too low a layer of bubbles will form around the object to be quenched and effectively insulate it against the cooling influence of the liquid.

The two classes of oil so far used most extensively for quenching are mineral oil and fish oil. Mineral oil of low flash point undergoes a chemical change when heated by the steel, becoming more viscous and therefore less effective as a quenching medium. Fish oil, on the other hand, is subject to rapid oxidation and whale oil is still more given to this trouble. The greatest stability is shown by a product of the distillation of wool grease. This oil possesses the further advantage of great fluidity and marked refrigerating properties. Price, of course, is an important consideration, and we can imagine that a product resulting from the distillation of wool grease is not particularly cheap, but the immunity from oxidation and chemical change warrant a higher price being paid for the oil, for not only does this chemical inertness permit of using the same oil for a very long time, but the results obtained in quenching are more uniform.

Wool grease itself is a product which until recently was allowed to go to waste. The discovery of new and important uses for this grease will serve to render the degreasing process more valuable and to extend its application. The science of by-products is a most interesting one and has never been cultivated so diligently as in these times of high prices and scarcity of materials.

Clerical Work and Female Labor

THE announced intention of the newly organized Women in Industry division of the War Labor Policies Board to exert its influence to the end that women shall first replace men in clerical and other office positions with manufacturing establishments to the greatest possible extent before they are called upon to do the work of men in the shops seems like a logical course of action.

Women have done remarkable work in industrial pursuits and have shown that they are capable of doing much that it was formerly thought they could not do in the way of heavy labor. But it is not yet unquestionably established that they are really fitted physically to do continuously some of the kinds of work that they have done for a relatively short period of time.

There are, of course, some women who can do almost anything that a man can do and keep on doing it indefinitely. But that is not true of all women and is certainly not true of a class of women who have been prompted by one motive or another to seek employment in shop work. The class referred to is made up of those women who have not been accustomed in any way to the restraint of industrial employment or the physical exertion entailed by it. They are the women who will very largely make up the addition to the ranks of labor which the sex will contribute. They should be placed first in positions where the work is of a kind that it has been demonstrated by long experience women can do efficiently and without bodily harm.

It is certainly not exercising good judgment to have men performing light work in the office of a manufacturing plant when women, unaccustomed to it, are doing heavy work in the shop. We should use the women on the light work first.

A Convincing Short Haul Argument

THE compilation and publication of figures showing the relative tonnage carried by motor trucks over the highways between Akron and Cleveland, Ohio, and the three railroads running between the Sixth City and the center of tire-making, during the 9 months ending July 1, call attention once more in a most emphatic manner to the immense possibilities that lie in the development of short-haul motor truck routes for the relief of railroad congestion.

The road from Cleveland to Akron is 40 miles long and the service which motor trucks are rendering on it is equivalent to that which could be performed by the use of no less than 885 railroad cars each week. These 885 railway freight cars were, therefore, released for service in long-haul work or for service which is more directly vital to the winning of the war, and congestion at the terminals at both ends of the run was reduced to a proportionate extent.

During a recent week motor trucks carried a total of 3175 tons of freight over this one Ohio route, while the railroads paralleled it with a total carriage of but 4970 tons, which is almost an even break between the two systems of transportation.

But great as this relief is, it is by no means all that the motor trucks are doing in this case and the many others similar to it. The 3175 tons of freight carried over the entire route from one end to the other is but part of the freight carried over this road, some of it from terminals to intermediate points, some between intermediate points and some long-distance matter which went over the highways because it could be more expeditiously transported that way than by railroad. Such freight comprised new passenger cars on their way to take their places in the scheme of things economic and new motor trucks, many of which were headed for localities in which they will carry on and extend the kind of work which the Akron-Cleveland trucks are doing.

Much has been done toward showing the world how the motor truck can help, how our roads can and must be used as an organized part of the country's transportation system. Much still remains to be done, for the country as a whole and many of those who sit in high places do not even yet grasp the full extent of the possibilities. Widespread publicity given to what has been and is being accomplished on the Akron-Cleveland route and others like it will be most effective. To even the most dubious it should be convincing evidence.

□ Latest News of the

Order 75,000 of Four Truck Models

Model TT, Four-Wheel-Drive, Adopted for Heavy Hauling—Ford for Light Work

WASHINGTON, July 25—Seventy-five thousand trucks and passenger cars have been ordered to date. Four trucks, including the Class AA, A, B and TT, form the cargo truck program. The TT truck, of which official announcement of adoption was made to-day, is a four-wheel drive type designed by the Engineering Ordnance Department. Several models have been completed and tested. This truck was designed in reply to a request from General Pershing, who stated that the cars and trucks now used in France were not satisfactory. The TT truck is especially suitable for hauling large guns over rough country and has the ability of a tank to go over places generally considered impassable to other vehicles.

The Ford passenger chassis, following the request of the American Expeditionary Forces, has been adopted as a standard chassis for use in the army as a passenger car, light ambulance, light truck and so forth. There are now 3000 Ford ambulances in use in France, and this number will soon be increased to 8000. The Ford Motor Co. is working on an order for 5000 light delivery trucks, production of which began July 22 at the rate of 200 per day. The principal reasons for the wider use of the Ford are the ease of repairing, cheapness of operation, large production and the extremely low initial cost and the fact "that it can be used where many other passenger cars cannot."

The other two types of passenger cars tested and selected are the Dodge chassis and the Cadillac chassis. These are not new and are the regular models with certain additions and deductions. They will be produced in other factories if the needs of the government require it.

The AA truck, which is the GMC ¾-ton model, was decided upon because of its low gasoline consumption and its light weight. The principal change from the regular model is a superior spring development needed because this model is to be used not only for cargoes but as a heavy ambulance also. Seven thousand, five hundred of these trucks are being ordered from various factories.

The Class A truck, which is the White 1½-ton truck with some changes, was selected after tests of many commercial trucks in all conditions of weather and load. It was adopted according to the Motor Transport Service because of lower gasoline and oil consumption, more satisfactory performance both in Mexico and France, high speed work with pneumatic tires and the low cost of spare parts, the cost being approximately equa. to the cost of the chassis complete. The Class A is to be used for staff observation, reconnaissance and as a high-speed truck.

One of the principal reasons for retaining the Class B model, originally known as the Liberty truck, says the Motor Transport Service, is its maintenance. Eighteen thousand of these trucks have been ordered. The cost of this truck is less than that of any other commercial trucks of the same capacity. The cost of the spare parts combined is identical with the cost of the chassis.

The Class B truck has given satisfactory service, a test of 15,000 miles, and was found to have greater strength, more power, more ability and to be better qualified on rough roads. an important factor, because this truck will operate in a zone of fire.

In rejecting many trucks under test the Motor Transport Service states that the rejections were in no way reflections on the commercial value of these vehicles. A majority of these were made for city work and consequently could not be expected to do exceptionally heavy rough work as required in France.

—

Huge Airplane Program Expected

NEW YORK CITY, July 25—Occasional hints have been given regarding the airplane program for the next 12 months, and while nothing official or specific has been announced, the program gives promise of being an enormous one. Rumors of building 68,000 Liberty engines have been current. Of these 50,000 would go into airplane work and the remainder might find use in other fields. It is to be hoped that the production of planes will go over the 25,000 mark.

These figures may appear small in comparison with some of the pro-optimistic announcements of 14 months ago, when some people talked of 40,000 airplanes in a year, and others ventured to suggest possibilities of 100,000 in a year.

A program of 25,000 fighting planes is a very conservative one. Great Britain is producing more than 50 per cent above this total at the present time and has been doing so for some months. America's program should be 50,000 planes in the fiscal year, or more if possible.

—

Moore is White New York Manager

CLEVELAND, July 23—William H. Moore, formerly manager of the White Co., Pittsburgh branch, has been appointed manager of the New York branch, to succeed R. H. Johnston, who was recently assigned to special executive work, with headquarters in Washington.

Bristol Type Plane Abandoned

Discontinued Manufacture Because It Is Tricky and Hard to Fly—Substitute Type

WASHINGTON, D. C., July 25—The discontinuance of the Bristol fighting airplane which has been manufactured at the Curtiss Airplane Corp. in Buffalo, is apparently due to a variety of reasons. It was intendtd that the Bristol plane, which is an adaptation of a British fighting plane, would use a twelve-cylinder Liberty engine. This engine has too much power for the plane.

For a month there have been occasional rumors regarding the failure of this plane. It has been known that the plane is very hard to fly and might be classed as dangerous. The original British Bristol has been designated a tricky plane but in the adaptation of the plane in America these troubles were increased. The reason seems to be that the upper wing produces a strong down draft, which exerts a downward pressure on the elevator. The result is a tricky machine and one that is very hard to manage. While this characteristic is present in the British prototype it was not serious.

For a time it was thought this defect might be remedied and although 100 of such machines were in production 2 months ago, it was found impossible to make a satisfactory flying machine out of it.

It has been suggested that an eight-cylinder Liberty engine would be about the correct size for a plane such as the Bristol. A year ago when the Liberty engine program was outlined, the program included an eight-cylinder type using the same cylinders and valve mechanism as the twelve. This program was disturbed last fall when it was decided to produce only the Liberty twelve.

Within the last few months it has been decided, although not officially announced, to start the manufacture of the Liberty eight. This seems to be due to the fact that the Liberty twelve is too powerful for many of the planes. In this connection it is reported that the Liberty twelve is too powerful for the DH-4 plane in which it is at present being used, and it has been suggested that a Liberty eight would have sufficient power for this plane in many cases.

It is understood that a new type of combat plant resembling the British Spad and will be known as the S. E. 5 will be built. It is to be manufactured here for use in France. This probably will be equipped with a Hispano-Suiza engine.

Automotive Industries

British Standardize Planes to 5%

Plan of S. A. E. to Further American Work Told at Dinner to Sir Henry Fowler

NEW YORK CITY, July 19—Sir Henry Fowler, representing the Royal Air Service of Great Britain in America, and also having in charge securing of materials for production of much of Great Britain's 3000-a-week airplane program, was given a testimonial dinner this evening by the Council of the Society of Automotive Engineers. The dinner was an informal affair which twenty attended. President Chas. F. Kettering, in presiding, told of the excellent co-operation between British aircraft engineers and American aircraft engineers in standardization work. This co-operation began with the international convention last January.

Sir Henry Fowler in referring to the possibility of greater standardization in airplanes, as well as in airplane engines, told of recent British experiments in which different engineers were asked to bring out a design that would meet certain war requirements. These engineers working along their individual lines produced machines that differed only in 5 per cent of their total. In other words, these machines were practically 95 per cent standardized. If it is possible to obtain machines that are 95 per cent standard by engineers working separately on the same assignment, it should not be difficult to obtain practically 100 per cent standardization with these engineers cooperating and working together on the same job.

The necessity for greater standardization in aircraft work was the dominating thought at the dinner. The S. A. E. has drafted a plan of aircraft standardization work which it believes could be satisfactorily worked out. This would bring together standardization work for the navy as well as the army. It would centralize this work in one person, together with a committee, which would bring about much quicker results than at present where a decentralized policy of standardization is resulting in chaos. The British policy of standardization is centralizing it in one person who has the authority to carry it out. This person has an organization of committees and sub-committees representing the various industries involved so that decisions are not arbitrary but the result of mature consideration.

—

Airplane Report After Aug. 1

WASHINGTON, July 24—Government control of all aircraft factories holding Government contracts is likely to be recommended by the Senate Aircraft Investigating Committee in its report which will soon be made public. The Committee is still holding hearings and it is likely that the report will not be made public until after Aug. 1. Members of the Wright-Dayton Aircraft Co. were examined yesterday.

The Liberty engine, it is reported, will be highly praised by the Committee. Its weight and power have been found of great value. It is reported that contracts for 60,000 of these engines will be placed during the next few weeks for various types but principally the Liberty 8's to be used in American tanks. It is said that only the Liberty engine will be used hereafter in tank construction in this country.

Control of the aircraft factories will probably be recommended through a centralization of the several factories now holding contracts. It is said that the Committee will find the earlier criticisms of the Senate fully justified and will give credit to John D. Ryan for bringing the program up to what is now considered a fairly satisfactory condition. Some of the members of the Committee promise "sensations" in the report but refuse to make them public now.

—

Pierce to Bring Out New Model With Twenty-Four Valve Engine

BUFFALO, July 24—The Pierce-Arrow Motor Car Co. will begin deliveries on Sept. 1 of a new passenger car model equipped with a 6-cylinder engine having 24 valves, detachable cylinder heads and thermostatic control of the cooling system. There will also be certain other detail improvements in the chassis which, so far as dimensions go, will be similar to the smaller one of the two models now produced.

—

Deutsch Enters Signal Truck

DETROIT, July 23—S. Deutsch, formerly vice-president of the Clus Mfg. Co., Milwaukee, and sales engineer of the Stewart Mfg. Co., Chicago, has been elected vice-president and director of the Signal Motor Truck Co., Detroit. He will have charge of production and sales.

—

Oakland Goes Into Truck Manufacture

PONTIAC, MICH., July 23—Within 90 days the Oakland Motor Car Co. will have on the market a 1-ton truck. It will be of 130 in. wheelbase and have turning radius of 25 ft. to the left and 21 ft. to the right. It will be equipped with solid 34 x 3½ front tires, and 34 x 5 rear tires. No schedule of producion has been determined.

M. T. S. Spends 15% of All Money

Motor Transport Service Completes Organization—Branches in Four Cities

WASHINGTON, July 23—Fifteen per cent of the United States Army averages of personnel, expenditures, service and equipment, it is reported, is in the hands of the Motor Transport Service, which displays that division's great importance and emphasizes the value of the internal combustion engine in this war.

The Motor Transport Service, headed by Col. Fred Glover, and created a few months ago, as announced in AUTOMOTIVE INDUSTRIES, is just completing its organization as shown in the chart herewith. The various appointments as made from time to time have been announced previously. The latest include the creation of four branch offices in New York, Cleveland, Detroit and Chicago which will have charge of production and inspection for their respective districts. Capt. John Devore is in charge of the Cleveland district, Major Wilcox of the Ordnance Department, the Detroit district; Captain Jaco of the Engineer Corps, the New York district and Major Edgerton of the Quartermaster Department, the Chicago district.

More than 6000 of the class B, 3-ton standard Army trucks have been deliv-

(*Continued on page* 168)

To Examine Kenly in Aircraft Hearing

WASHINGTON, July 22—The examination of Major General William L. Kenly, Chief of the Department of Military Aeronautics, Saturday is expected to conclude the hearings of the Senate Military Sub-Committee investigating aircraft production. The committee will probably draft a report within the next week. It is expected that the report will not touch upon the alleged extravagances and mishandling of Government money, that phase of the situation being entirely in the hands of the Department of Justice and Charles E. Hughes, President Wilson's special investigator.

General Kenly's testimony was not made public, but it may be said it was chiefly a discussion of remedies for conditions found by the committee.

—

Olds to Manufacture Trucks

LANSING, July 23—The Olds Motor Works is planning to bring out a ¾-ton truck in the near future. It is stated that the output will be 8000 trucks for the coming year.

The Government's Labor Program

Plans Completed for Federal Recruiting and Distribution of Nation's Labor Supply—Unskilled Shortage Now 500,000 and Soon Will Be More Than 2,000,000

WASHINGTON, July 20—The war industries are at present short 500,000 unskilled workers and coming needs are for between 2,000,000 and 3,000,000 more, according to Nathan A. Smyth, Assistant Director General of the United States Employment Service in charge of its unskilled labor section, who addressed leaders of industry management and labor here to-day. The conference comprised industry management and labor authorities from 28 states east of the Mississippi River, who were here to learn the details of the Government's war labor recruiting program, and who will form the community labor boards which will enforce the new labor regulations in the various localities.

It is also said that the demand for skilled workers exceeds the immediate available supply and before long will require the taking over of every tool maker and dye sinker for war work.

On the other hand, several speakers, including employment managers of large corporations on war work, told how the United States Employment Service efficiently has supplied their labor needs. One example was that of the American National Corp. at Hog Island, for which the Employment Service secured 30,000 men.

The complete program for supplying war labor was outlined. The need for a program was attributed to the growing inability of war industries to secure required labor resulting from:

Causes of Labor Shortage

Decreased labor supply due to cessation of immigration since 1914.

Competitive recruiting for labor.

Restlessness of labor.

Stripping of war industries through reckless labor recruiting.

Hoarding of labor supply by individual states.

The program will be enforced promptly by the co-operation of every patriotic citizen; ultimately by the full force of every Government department.

The principles of the plan are based on the fact that:

In time of war all labor resources constitute a common supply for the benefit of war industries.

Industries not directly connected with the war should contribute equitable shares of their labor to important war needs.

Equitable distribution of non-war workers can be secured only through central agencies, directed by President Wilson, to have sole direction of all recruiting of civilian workers in war work.

Recruiting of labor must be solely conducted so as not to take men from war work, railroads or farms.

Movements of labor should be made and placed as near as possible to the demand.

Competitive increase in wages should be prohibited and war wages stabilized so far as possible.

The new program will be carried out by the recruiting and distribution of labor through the United States Employment Service of the Department of Labor. Paid officers of the service and agents of the Public Service Reserve, the recruiting branch of the service, whose agents are largely volunteers, will conduct recruiting.

Recruiting and Distribution Plans

Distribution of labor will be controlled by the Employment Service.

Local community boards comprising representatives of employers and the service will assist recruiting and distribution.

Control of private and prevention of competitive recruiting will be accomplished by the United States Employment Service backed by the power of other Governmental departments.

It is expected that these agencies will:

Eliminate competitive recruiting promptly.

Standardize wages as soon as the War Labor Policies Board announces a wage scale.

Operate successfully through the 500 branches of the United States Employment Service.

The program applying to the recruiting of unskilled labor will be effective Aug. 1. It will handle unskilled labor first because the shortage is more acute, but will shortly take over all war labor problems.

The program will be extended to cover "hiring at the gate" when it is sufficiently organized, and will take over non-war work labor in case competitive recruiting by non-war employers proves injurious to war industries.

In the meantime employers are permitted to do their own recruiting of skilled labor but after Aug. 1 must not:

Offer superior inducements to men already employed in war work.

Advertise unless authorized by the Employment Service.

Arrange to advance pay for transportation of labor except with the consent of the United States Employment Service.

Employers not engaged in war work may recruit labor themselves but must not:

Offer superior inducements to workers in war work.

Advertise for labor without the consent of the Employment Service.

Women Not Included

The new recruiting program for the present does not cover the recruiting of women workers.

It includes only at this time plants whose maximum force exceeds 100 men. Labor may be recruited privately for railroads and farms. War work is taken to mean the manufacture of any product or erection of any structure directly or indirectly connected with the war.

Coal mining is not wholly war work.

Railroads and farms are engaged in war work to the extent that they are to be protected from recruiting by other industries.

An employer engaged only partially in war work is prohibited from recruiting labor himself for his war work to the same extent as if he were engaged wholly in war work. He will receive the benefits of the Government's recruiting program in getting labor for his war work. He will be expected to contribute from his non-war organization for war work purposes. He will have the same rights for securing labor for non-war work as employers engaged wholly in non-war work.

Unskilled labor is defined as meaning common labor.

A card system may be devised later by the Employment Service, but none is contemplated for the present.

An organization of 100 workers means an organization where 100 males, exclusive of clerical and administrative force, is employed.

Employers can establish the fact that they are doing war work by submitting the facts to the state director of the United States Employment Service of their state.

No Restriction of Choice

Employers will not be restricted in their choice of the men recruited for them. They can exercise the right of choice either at the plants or at the points where the labor is recruited. Employers can hire men who come unsolicited, but this is not considered advisable by the Service. Employers partially engaged in war work will be allowed to use only labor sent by the Service in private work under permit.

The state directors of employment are to be referred to in all doubtful labor cases. Appeal can be taken from them to the director general of Employment Service at Washington, who in serious cases will secure a decision from the War Labor Policies Board. Workers are not under compulsion to get into war work except from a sense of duty, and are free to take any job offered by the Service they may prefer. They can secure work in any way, by their own solicitation or through the Employment Service, but it is urged that they use the Service. Workers will be told conditions of employment and terms as far as possible before they are enlisted for the work. They do not have to accept the position if transported under Government auspices if they do not want to, but must refund the transportation costs.

There is no limitation to the length of time a worker must stay at the position secured for him by the Service. He may change his job whenever he desires. There will be no form of black list created. Transportation will be paid to the point of employment or advanced and deducted from wages. This will be later uniformly established by the War Labor

Policies Board. Wages will not be paid during the time of going to the job. Cost of feeding workers en route will be made a part of the transportation.

Demands for unskilled labor will be ascertained by blanks distributed to all employers through the various Government departments. All employers should have received such blanks before July 20. If not received they should apply to the state director of the Employment Service.

Unskilled labor will be divided into quotas to prevent any state or community from being drained unfairly. The quotas will be determined by the United States Employment Service, according to estimates secured from each state showing the extent to which workers have already been sent to war industry and what unskilled labor still remains in non-war industry. The quotas will be distributed on the basis of the male population in the respective states corrected by the estimates of changed conditions due to the war and according to the extent of the population in agricultural work. Quotas will be announced as soon as all data are received.

It is expected that all employers in non-war work will take back the workers recruited for war work when they are no longer required in the latter industry.

Local labor supplies will be issued so far as adequate to meet local demands. Where the supply is not sufficient it will be distributed primarily among employers requiring similar numbers, assigning to the employers who need larger numbers of men those brought from other states.

Will Advance Transportation

The United States Employment Service will transport the workers out of its funds and collect this cost from concerns benefited. Movements of men for any considerable distance will be considered only in parties escorted by officers of the Employment Service. They will be examined by experts, physically and mentally, as to qualifications before being transported.

Employers requiring war workers should fill in the blanks received from the Service and all additional blanks weekly as demand for workers require. Employers engaged in non-war work can secure assistance from the Service if they desire it, but may recruit workers separately from the Service provided they do not offer superior inducements.

Individual workers desiring war work should register with the nearest branch office of the United States Employment Service or with the local agent of the public service reserve. Individual workers are warned not to leave non-war jobs before the Service secures war work for them.

A non-essential industry is any industry not engaged in war work directly or indirectly.

—

Packard Leases Adjoining Plant

DETROIT, July 23—The Packard Motor Car Co. has leased for 3 years the plant formerly occupied by the National Body & Trimming Co.

Industrial Condition Reports

Score of Regional Representatives Will Collect Data on Sources of Supplies

WASHINGTON, July 22.—For the purpose of keeping the Government advised concerning sources of supplies and industrial conditions in all parts of the nation, twenty regions have been created with regional representatives. National conditions in providing new resources, conversion possibilities, direct contact between the War Industries Board and business, and uniform methods will be handled by these representatives. They have been appointed as follows:

Region No.	Headquarters	Representative
1.	Boston	Stuart W. Webb
2.	Bridgeport	D. B. Pierce, Jr.
3.	New York	Wm. F. Morgan
4.	Philadelphia	Ernest T. Trigg
5.	Pittsburgh	George S. Oliver
6.	Rochester	Esten A. Fletcher
7.	Cleveland	Wm. B. McAllister
8.	Detroit	A. H. Templeton
9.	Chicago	D. E. Felt
10.	Cincinnati	Edwin C. Gibbs
11.	Baltimore	———
12.	Atlanta	———
13.	Birmingham	T. H. Aldrich
14.	Kansas City	F. D. Crabbs
15.	St. Louis	Jackson Johnson
16.	St. Paul	———
17.	Milwaukee	August H. Vogel
18.	Dallas	Louis Lipsitz
19.	San Francisco	Frederick J. Koster
20.	Seattle	———

To illustrate the conversion possibilities the War Industries Board points out that a former Pennsylvania linoleum factory is now making 4.7-in. shells, a Duluth horseshoe manufacturer is turning out trench picks, a Milwaukee rowboat motor maker is manufacturing hand grenades and trench pumps, a Detroit stove company is producing bombs and anchor parts, and a New York shirtwaist manufacturer is making signal flags.

The regional organizations will be under the supervision of Charles A. Otis Chief of the Resources and Conversion Section of the War Industries Board.

—

Plans Tractor Courses for Owners

CHAMPAIGN, ILL., July 23—The Department of Farm Mechanics of the State University of Illinois is arranging a series of 2-week tractor courses which will run from Oct. 15, 1918, to March 17, 1919. The attendance will be limited to 50 pupils for each course, recruited from tractor owners and automotive dealers.

Eight hours of each week day will be devoted to the study of tractors and tractor equipment. The time will be divided between two lectures and six hours of laboratory practice.

—

Metzger Heads Truck Committee

LANSING, MICH., July 20.—William E. Metzger of Detroit has been elected chairman of the Committee on Motor Truck Highways and Express Routes appointed by Governor Sleeper to further the plan of motor truck expresses in this State. Fred Z. Pantlind of Grand Rapids was chosen vice-chairman and Burt Wickham, assistant secretary of the War Preparedness Board, secretary. Arrangements for a complete census of the possible routes in the State, through the various Chambers of Commerce, Boards of Trade and other civic organizations, will be started at once. Resolutions were also adopted asking a change in the State constitution so that regular rates can be made for the various routes, thus controlling them as common carriers under the railroad act.

—

M.A.M.A. Would Support Airplane Show

NEW YORK, July 20.—At the quarterly board meeting of the Motor and Accessory Manufacturers Assn. is was decided that this body will support an airplane show if such is permitted to be held by the War Department. The show committee of the association was instructed to make its usual contracts with the National Automobile Chamber of Commerce covering both the New York and Chicago shows.

E. W. Beach has resigned as a member of the executive committee because of his affiliation with the Bureau of Aircraft Production in Washington but will remain a member of the Board of Directors. His place on the executive committee will be taken by William M. Sweet.

One new member, the Sewell Cushion Wheel Co., Detroit, was elected to membership.

—

Working Hours and Industrial Efficiency

In the article on pages 89 to 91 inclusive of the July 18th issue of AUTOMOTIVE INDUSTRIES which dealt with the effect of long working hours on industrial efficiency, the diagrammatical illustrations for cases one and two were transposed accidentally with those for cases three and four respectively.

—

Ajax to Move Executive Offices

NEW YORK, July 23—The Ajax Rubber Co., Inc., has taken over the four-story building in West Fifty-seventh Street owned by the American Society of Civil Engineers. This will be altered considerably and used as the company's executive and general offices. The Ajax organization will move from 1796 Broadway to this building on Dec. 1.

—

To Study Hazards to Women in Industry

WASHINGTON, July 22—A committee has been appointed to investigate the special hazards to women in war industry. It will visit various centers where women are at work on war contracts and make investigation. The first trip will be to Niagara Falls, N. Y., to study the women's work in mechanical industries. The committee includes Lt. Col. Mock of the Surgeon General's office, Chairman, Capt. A. D. Reiley, Ordnance Department, Dr. Alice Hamilton, Department of Labor, and others from various governmental departments.

Women Are Efficient in Metal Trades

National Industrial Board Report Shows Them Especially Valuable in Repetitive Work

BOSTON, July 23—The National Industrial Conference Board has just issued a report concerning the employment of women in the metal trades which summarizes data obtained from 131 metal working establishments employing a total of 335,015 men and 49,823 women. The main conclusion of the report is that the employment of women, in this branch of industry, has met with a high degree of success. In the plants from which data were received, women were for the most part employed on the lighter classes of work while men did the heavier work and that which required a high degree of skill. As has been evidenced almost everywhere that investigations have been made regarding the use of women in industries, they have been found most valuable on work of a repetitive character and on this kind of work, the report indicates, they were found to do better work and to turn out more of it than men. They are also given credit in the report for taking better care of their tools and being more steady and dependable. The opinions of most of those who furnished the Conference Board with information seemed to agree that the best methods of training women for metal work is provided by the vestibule school or by special classes at the factory where they are to work.

The principle of equal pay for equal work has been rather generally accepted among the manufacturers who reported. That women learn more quickly than men, especially the type of men that are now available, was pretty generally agreed to by the employers making returns. They are also considered to have a more wholesome attitude toward their work. In only eight plants was woman regarded as the inferior in this particular.

The report shows that in sixty-four establishments of the ninety-seven furnishing specific information on the relative output of men and women, and where men and women were employed on the same processes, the output of women was equal to, and frequently greater than, that of men. In only fifteen establishments was the output of women less than that of men on all operations on which both were employed. In the remaining eighteen their production, although less in some operations, equaled or exceeded that of men in others.

"A highly favorable account of the efficiency of women," says the report, "comes from an automobile plant where they are employed in twenty-three departments on assembling and inspecting materials and on many types of machine work. In this case the comparative output of women on identical processes was almost invariably greater than that of men, and in some cases quite disproportionately so. This establishment reported an instance where a woman employed on a nut tapping machine turned out at the end of her first week about double the output of the man working next to her. After endeavoring to equal her speed for a few days the man quit and was replaced by another woman, who is now very nearly the equal of the first.

"Whether technical training would make women the equal of men in work of higher character cannot be determined from available experience. It is noted, however, that there are certain operations which no employer reports as being performed as well by women as by men—for instance, lapping and brazing, both of which require considerable skill. Again women have not proved themselves the equal of men in such comparatively heavy work as chipping castings and machine filing.

"The permanence of women's position in the metal trades will depend in part on the attitude and economic strength of male workers after the war. Surprisingly little opposition to the introduction of women has thus far been encountered from men—possibly because of the relatively small number of women thus far employed or because the urgency of the step was recognized. Whatever the ultimate experience may be, the ability of women to perform a large variety of operations in the metal trades has been convincingly demonstrated."

New collar insignia of the Air Division of the Signal Corps

Curtiss Subsidiary in Atlantic City

ATLANTIC CITY, N. J., July 23—The Curtiss Flying Machine Co., a subsidiary of the Curtiss Aeroplane & Motor Corp., Buffalo, will establish an aircraft plant on the Inlet, where about 100 men will be employed. The company has received a contract from the Navy Department for seaplane parts.

Gasoline Up One-Half Cent a Gallon

NEW YORK, July 20—The price of gasoline has been advanced one-half a cent a gallon in New York City and environs. The Standard Oil Co. has sent out notices to all its customers to the effect that beginning to-day the wholesale price is to be 24½ cents a gallon. The Gulf Refining Co. and the Texas Co. have both made a similar increase. The Tidewater Oil Co., which has refineries in New Jersey, has not yet advanced the price of gasoline, though an increase is looked for by dealers.

Makers Constantly Change Plans

Manufacturers Unable To Tell What Will Happen Next—Conditions Unsettled

DETROIT, July 23—There has never been a time when it was more difficult for manufacturers to guess what will happen. Passenger car makers cannot plan for more than a week ahead. Frequently plans must be changed the next day and rearrangements are almost constantly being made due to the unsettled condition of the steel situation.

Already the majority of car manufacturers are below 33 1/3 per cent of their normal output and rapidly nearing the 25 per cent line. A number of them have reached a production equal to 25 per cent of their normal capacity.

The present coal scare is considered by some manufacturers as good propaganda as it has had its effect in frightening many into supplying themselves with fuel, and that otherwise they would have been lax in doing so. Never in the hisory of Detroit has so much coal been stored. This has taken many manufacturers out of the market and makes more fuel available for other purposes later.

To Investigate Eastern Aircraft Plants

WASHINGTON, July 23—Attorney-General Gregory, William Frierson and Charles E. Hughes, who have been investigatiing aircraft production at Dayton, will return to Washington shortly. The next investigation will be at eastern aircraft factories, to be made within the next few weeks.

A. A. A. Sanctions Chicago Speedway

CHICAGO, July 23—The Speedway Race to be held next Sunday, which will be sanctioned by the A. A. A., is to be a Class E, non-stop, special invitation, 5-cornered match race. There will be 4 heats, the distances of which have not yet been determined. The contestants are Ralph De Palma, Ralph Mulford, Louis Chevrolet, Arthur Duray and Dario Resta. The management has posted $15,000 and each driver will post $2,000. The total will be divided according to the points of each driver, dependent on his position at the finish.

Dart Adds to Personnel

WATERLOO, IOWA, July 23—The Dart Truck & Tractor Corp. has made several additions to its forces. M. D. Millner has been added to the purchasing department. Frank Wermes has been appointed superintendent and production manager. The sales department has been increased by the addition of F. W. Kleist, formerly western manager of the Sheldon Axle Co.; John R. Williams, formerly assistant sales manager of the Velie Motors Corp., and Dwight L. Mink.

Chicago Exposition Draws 90

Makers Sign Up for Automotive and Accessories Exhibit on Municipal Pier

CHICAGO, July 23—Ninety exhibits have been secured thus far for the Automotive and Accessories Exposition which is to be held Sept. 14-21 on the Municipal Pier. The list follows:

S K F Ball Bearing Co.....Hartford
Hoosier Auto Parts Co.....Muncie, Ind.
A. F. and B. Specialty Co.....Milwaukee
Milwaukee Forge Machinery Co...Milwaukee
Higgins Spring & Axle Co.....Racine, Wis.
Arrow Grip M. Co.....Glenn Falls, N. Y.
Clark Publishing Co.....Madison, Wis.
Indiana Mfg. Co.....Indianapolis
Carborundum Co.....Niagara Falls, N. Y.
Fordowner .....Milwaukee
Motor Vehicle Publishing Co.....New York
Essankay Products Co.....Chicago
A. W. Shaw Co.....Chicago
System on the Farm.....Chicago
Twin City Varnish Co.....St. Paul
H. G. Paro Co.....Chicago
Ekern Bros. Mfg. Co.....Flandreau, S. D.
Automotive Accessories Co.....Baltimore
Perfex Radiator Co.....Racine, Wis.
New Lite Lens Co.....Chicago
U. S. Auto Supply Co.....Chicago
Brown and Caine, Inc.....Chicago
Metal Specialties Mfg. Co.....Chicago
Geo. D. Bailey Co.....Chicago
Jefferson Electric Mfg. Co.....Chicago
Atlas Specialty Mfg. Co.....Chicago
The Reliance Co.....Chicago
Harry Newman.....Chicago
Advance Accessories Corp.....Chicago
Bailey Non-Stall Differential Corp...Chicago
Milwaukee Auto Engine & Supply Co., Milwaukee
The Zinke Co.....Chicago
Shurnuff Mfg. Co.....St. Louis
Romort Mfg. Co.....Oakfield, Wis.
Champ Spring Co.....St. Louis
Standard Underground Cable Co..Pittsburgh
Metal Ware Corp.....Chicago
Burgess Mfg. Co.....St. Joseph, Mich
Blake Mfg. Co.....South Bend, Ind.
Challoner Co.....Oshkosh, Wis.
Cooper Auto Specialty Co...Thomasville, Ga.
Motor Car Equipment Co.....New York
The Duplex Engine Governor Co....Brooklyn
Van Cleef Bros.....Chicago
Edelman & Co.....Chicago
Cummings Foster Corp.....Chicago
Perry Auto Lock.....Chicago
Defender Auto Lock.....Detroit
McIntyre Mfg. Co.....Chicago
The Dayton Wire Wheel Co.....Dayton
W. D. Sullivan.....Chicago
Dole Valve Co.....Chicago
Empire Auto Specialty Co.....Chicago
Koupet Auto Top Co.....Belleville, Ill.
Heinselman Bros. Co.....Belleville, Ill.
Presto Cloth Mfg. Co.....Toledo
Wood Hydraulic Hoist Body Co.....Chicago
A. A. Lawder Sons Co.....Chicago
The Wyman Sales Co.....Chicago
Balso Oil Co.....Toledo
Balso Oil Co.....Council Bluffs, Iowa
Agrimotor .....Chicago
Falls Motor Corp.....Sheboygan Falls, Wis.
Buller Coupler Sales Co.....Madison, Wis.
Orange Judd Co.....Chicago
White Star Refining Co.....Detroit
American Manganese Steel Co.....Chicago
La Crosse Tractor Co.....La Crosse, Wis.
Hooven Radiator Co.....Chicago
Electric Steel Truss Wheel Co.....Chicago
Guaranteed Tractor Corp.....Chicago
Sumter Division, Splitdorf Electrical Co., Chicago
Commercial Truckmobile Co.....Chicago
One Wheel Truck Co.....St. Louis
Winther Motor Truck Co., Winthrop Harbor, Ill.
Traffic Motor Truck Corp.....St. Louis
Hudford Co. .....Chicago
Mechanical Belt Co.....St. Joseph, Mo.
K & D Lamp Co.....Cincinnati
New Era Specialty Co..Grand Rapids, Mich.
Eclipse Valve Grinder Co.....Kansas City
Link Belt Co.....Chicago
Harding & Co.....Chicago
Anderson Electric Specialty Co.....Chicago
Atlas Auto Supply Co.....Chicago
N. A. Petry Company.....Philadelphia
Reflex Ignition Co.....Cleveland
Nilson Tractor Co.....Minneapolis
Forschler Motor Truck Mfg. Co..New Orleans
Gray-Heath Co. .....Chicago

The products of the following companies will be exhibited in the Gray-Heath Co. section:

L. P. Halladay Co.....Streator, Ill.
New York Coil Co.....New York
A. C. Savidge Co.....Indianapolis
Cuno Engineering Corp.....Meriden, Conn.
Cole Gasoline Gauge Co.....Chicago
Wright Roller Bearing Co.....Philadelphia
Newtone Horn Co.....Brooklyn
"X" Laboratories .....Boston
Hudson Motor Specialty Co.....Philadelphia
James P. Neerup Co.....Chicago
F. W. Oettinger Co.....New York
Lockfast Tire Carrier Co.....Cleveland
Standard Speedometer Co.....Boston
General Appliance Co.....Boston
Hansen Mfg. Co.....Cleveland
Gibraltar Jack Co.....New York
Halsted Mfg. Co.....New York
Bell Mfg. Co.....Detroit
Continental Piston Ring Co.....Memphis
A. E. White Machine Works..Eau Claire, Wis.
Harris & Reed Co.....Chicago
Barcolo Mfg. Co.....Buffalo
Friden Mfg. Co.....San Diego, Cal.

—

Charge Unfair Competition Methods

WASHINGTON, July 22—The Goodyear Tire & Rubber Co. is charged with unfair methods of competition by the Federal Trade Commission. The company has been notified to appear at a hearing here Sept. 3. The complaint charges the Goodyear company of unfair methods by seeking special agreements with retail dealers to maintain standard resale prices on its tires, inner tubes and accessories. The company is further charged with an attempt to mislead the public in its nation-wide advertising of Goodyear service stations, these stations being, it is alleged, independent of the Goodyear company and maintained by dealers and dependent upon them. The service, it is declared, is furnished by dealers regardless of the makes of tires used by their customers.

It is charged that an arbitrary control over the business of dealers is maintained by threats of price discrimination which forces dealers to maintain excessive stock supplies of Goodyear products, to maintain standard prices for these, to report "underselling" by other dealers, and to specify Goodyear equipment on passenger cars, motor trucks and motor cycles which the dealers may handle.

It is further alleged that the company sells tires at dealers' prices direct to large truck users on condition that a fixed percentage, usually 90 per cent, of a company's monthly requirements be filled with Goodyear tires and supplies. Competing tire makers, it is set forth in the complaint, are injured in their business by these "unfair" practices, as are the dealers and the public.

The Goodyear attorneys and managers in New York state that an excellent defense exists against the charges and that many of the items mentioned in the complaint are quite common in merchandising generally.

—

Crowther Plant Sold

ROCHESTER, July 23—The plant of the defunct Crowther Motor Car Co. has been sold to a Buffalo tire manufacturing concern. The new firm, which has been incorporated under the name of the Rochester Tire Corp., will begin work at once. The building is of the single-story type, 150 x 200, and has about 30,000 sq. ft. of floorspace.

British Aviators to Fly Over West

Brig.-General Lee To Head Demonstration Flight Over 16 Mid-West Cities

WASHINGTON, July 23—Brig. General Charles F. Lee, commanding the British Aviation Mission in this country, will make an airplane tour of the middle western states, assisted by Captains J. J. Hammond, James Fitz Morris, W. A. Hannay and G. E. Hunter. The tour will be a practical demonstration of aerial fighting. All of the officers engaged are distinguished members of the Royal Air Forces and have seen active service. They will start from Indianapolis on or about Aug. 14, and stop at 16 of the principal mid-western cities, making total air flights of 2500 miles. They will show the various air "stunts" and will point out in public talks the necessity for teaching advanced flying to our aviators.

Airplanes used will include a De Haviland fighting machine, a Bristol fighter and 2 British Avro training planes. It is also possible that some Sopwith Camels and S. E. 5's will be available as these are expected from abroad, and will be used if they arrive in time.

The itinerary will include air flights by at least 3 machines between Indianapolis, Cincinnati, Dayton, Columbus, Cleveland, Buffalo, Detroit, Toledo, Chicago, Milwaukee, Minneapolis, St. Paul, Des Moines, Omaha, Kansas City and St. Louis, probably in the order mentioned. Flights will be made over cities, the fliers going through aerial battle tactics and all the air antics known. The tour will extend through August and end early in September. Captain G. D. Hunter, R. A. F., has gone to Indianapolis to start a trip around the proposed circuit, making arrangements and selecting landing sites.

—

Automotive Corp. to Make Royal Tractor

LOUISVILLE, KY., July 23—The Automotive Corp. has taken over the manufacture of the Royal tractor, and will start active production immediately at Napoleon, Ohio.

The Automotive organization, which recently purchased the assets of the Sun Motor Car Co., Elkhart, Ind., was organized in Delaware. The officers are: President, George G. King; vice-president, Robert Crawford, formerly president of the Sun Motor Car Co.; secretary and treasurer, William Hulin, formerly secretary and assistant treasurer of the Pan-American Motors Corp. C. W. Babcock, formerly associated with the Kelly-Springfield company, has been appointed manager of the truck department.

The Royal tractor has two wheels and is driven by means of a pair of lines in the same manner that a team of horses is driven. Kerosene is used for fuel, and the speed varies from 1½ to 8 m.p.h. The tractor will pull 14 plows and can be used with all present farm implements without any change.

To Take Over Detroit Return Load Work

Transportation Association Has Been Formed to Sell Highway Haulage at Fixed Rates

DETROIT, July 22.—Selling highway transportation to shippers and consignees by the employment of highly trained investigators and the establishment of fixed rates for highway haulage between Detroit and points within a radius of 180 miles, are the outstanding objects of the Detroit Transportation Assn., which is being formed here by John F. Myers, formerly of the firm of Houghton & Myers, Inc., distributers of Stegeman trucks in the Detroit territory. This association may eventually prove to be the solution of the Return Loads Bureau idea as a permanent institution for the reason that it is attacking the problem of highway transportation where most of the Return Loads Bureaus have failed, viz., in selling highway transportation to the shipper of goods and to the consignee.

The membership of the new association will be made up of individuals and companies having either motor trucks or horse wagons to hire out. Private truck owners whose vehicles are idle for part of their time will also be eligible. The association will be financed by its members, who will pay certain sums as monthly and eventually yearly dues. These dues have not yet been determined, but will be decided upon by the number of members in the association, the idea being to set the dues at a figure which will just pay the operating expenses, but not form any sinking fund. Under this proposed plan of organization the larger the number of members, the smaller the dues.

More than thirty applications for membership in the association have already been received. It has been suggested that the monthly dues per member be $20 a month, or $240 a year, but this may be reduced if sufficient members are enrolled.

The new association will take over the work of the Detroit Return Loads Bureau, now handled by John F. McNally.

—

Goodrich Has Training School

AKRON, July 22.—As part of the Government's plan to educate 90,000 men for specialized work in American universities this year the B. F. Goodrich Rubber Co. has provided a special classroom and working benches for the students. The men make daily tours of inspection through the tire-making departments; listen to lectures by department heads; repair tires that have been through every possible manner of abuse; learn how to demount and mount rims quickly; learn what to avoid in adjusting a rim to a wheel, and read manuals and books dwelling on the care and repair of tires.

The soldiers are drilled in quick and effective methods of repairing not only automobile and motorcycle fabric tires but also cord tires for automobile and airplane use. This work is in co-operation with the University of Akron.

It is the plan of the Government to establish scores of American tire repair stations back of the lines on the Western front where American ambulances, officers' cars, Signal Corps cars, dispatch riders' motorcycles and all pneumatic tired vehicles and planes may instantly and efficiently have their "shoes" cared for.

—

Makers Submit Headlamps for Test

ALBANY, N. Y., July 20.—Forty-three manufacturers of devices designed to control light emanating from headlamps have submitted their products to Secretary of State Francis M. Hugo for testing as provided under the new State law. Under the terms of this measure, such devices are to be tested and if they conform with the requirements of the headlamp law, a certificate of approval will be issued to the manufacturer. It is expected that the names of the manufacturers whose devices comply with the requirements will be made public in the near future.

—

Ford Heads Labor Umpires

WASHINGTON, July 23—Ten citizens appointed by President Wilson to act as umpires in labor controversies which cannot be settled by agreement of the members of the War Labor Board include: Henry Ford, Matthew Hale, Boston; James Harry Covington, Washington; Charles Caldwell McChord, Washington; V. Everit Macy, New York; Julian William Mack, Chicago; Henry Suzzallo, Seattle; John Lind, Minneapolis; William R. Willcox, New York, and Walter Clark, Raleigh, N. C.

These men will settle the arguments between employers and employees when the War Labor Board is unable to reach that end. Up to this time there has been no need for such umpires, and the President's appointment is merely to meet a possible future problem of this kind.

—

Truck Plant Being Enlarged

KENDALLVILLE, IND., July 22.—The Noble Motor Truck Corp. has purchased a site of 10½ acres on which a building will be erected that will add 140,000 sq. ft. of floorspace to the plant. The railroad spur has already been laid and building operations will begin soon. In the past the Noble truck has been manufactured in the 2-ton size, but as soon as the new addition is completed 1 and 3-ton trucks will also be turned out.

—

To Double Service Truck Capacity

WABASH, IND., July 20.—The Service Motor Truck Co. has started work on two new buildings which will double the present floorspace of the organization.

Electric Automobiles Unknown in Chile

Need Co-operation with Lighting Companies and Salesmanship to Popularize them

SANTIAGO, CHILE, July 19.—There are no electric automobiles in Chile. Despite the fact that Chile is a nation populated by 4,000,000 people who engage in farmwork and foreign trade throughout large cities where there are few hills and fair pavements, there are no electric automobiles to be seen, according to a pamphlet on "Electrical Goods in Bolivia and Chile," issued by the Department of Commerce.

Gasoline passenger car business is good and there are many agents, but none has ever attempted to push the electric, nor have the electric light companies offered encouragement in this direction. Conditions, states the report, are especially good in Santiago for the use of electrics, as the streets are paved with asphalt or well-laid Belgian blocks and there is scarcely any grade. The central station has day circuits so that facilities for charging batteries could be easily arranged either in the home or at a garage.

The weather is ideal, for it never is cold enough to do any damage, the lowest temperature in 65 years being 26 deg. Fahr. The rainfall is not excessive, averaging only 15 in.

Use Cars for Trucking

A number of secondhand gasoline passenger cars have been equipped with homemade bodies and are being used for trucking in competition with 2-wheeled ox carts. One of the mines operated by American capital uses 5-ton gasoline trucks which are the only automobile trucks in the country excepting a few used for demonstration purposes by large importing houses.

There is undoubtedly, the report states, a tendency toward the wide-spread development of this type of conveyance and it is possible that the electric car will benefit by the movement, but this cannot take place until an active campaign is begun to acquaint the people with what the electric automobile can do. On account of the absence of roads or boulevards in the country the gasoline car has not the advantageous position with respect to the electric which its long-distance touring radius gives it elsewhere. The two points in favor of the electric in the United States, namely ease of operation and cleanliness, do not apply in Chile, where the owner seldom drives, and it is only within the last year that women have driven cars at all. One point against the electric is the price, for with the same money or less one can buy a much larger gasoline car, and size is important because the large car looks imposing and because families are large.

In order to be successful in introducing electric vehicles it would be imperative

to have a live agent push them and get concessions from a lighting company in the matter of special rates for current. The agent would have to furnish expert help to keep the batteries in good condition as few people would understand them. If these conditions are complied with there should be a fair business in this line.

—

Making Poplar Propellers at Kelly Field

KELLY FIELD, TEX., July 20.—Poplar propellers instead of mahogany are being manufactured at Kelly Field. This is the only aviation camp in the country which makes its own propellers and is also the only one employing poplar.

Propellers made at Kelly Field are said to cost the Government less than 20 per cent of the price paid for them in buying from private concerns. Poplar contains less moisture than most of the other varieties of wood used for propeller making and is therefore better suited for a hot, dry climate where absorption of moisture often causes one made of other material to break. Eighty men are employed in the shop when it is operating at full capacity.

—

New Body Model for Stephens 76

FREEPORT, ILL., July 20.—A new 6-passenger body is in limited production by the Stephens Motor Branch of the Moline Plow Co. The body follows closely the lines of the former 4-passenger model but is longer, to accommodate two auxiliary seats. It is fitted to the same chassis as used in other Stephens models. The finish is in green with a fine gold stripe, and natural wood wheels. Among the refinements are Blackmore curtain openers, bullet lights, rear tonneau light, an electric light under the hood, accelerator foot rest, Johnston plate glass window in the rear curtain, dash gasoline gage, and oversize 33 x 4½-in. tires. The price is $1,850, f.o.b. factory.

—

Ford Employees Laid Off

DETROIT, July 23—The Ford Motor Co. has temporarily laid off 10,000 men, according to a report received here. Practically all of these were employed in the passenger car division.

Settle Army Truck Program

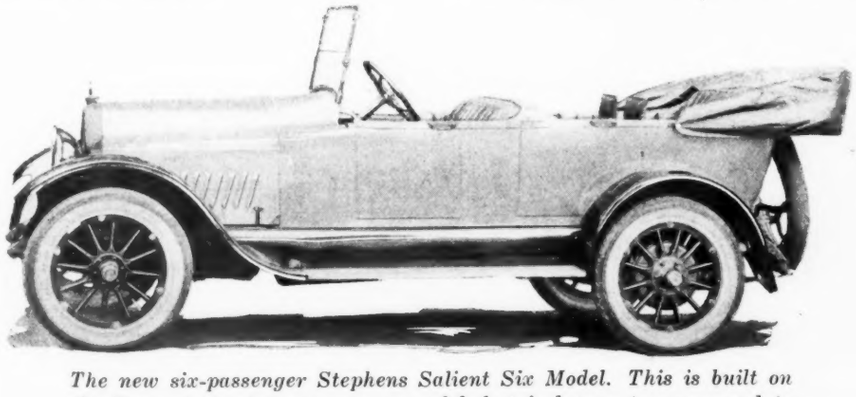
White 1½-Ton Model Substituted for Original A—¾-Ton G. M. C. to Be AA

WASHINGTON, July 22.—The White 1½-ton truck, manufactured by the White Co., Cleveland, Ohio, will replace the original A, 1½-ton standardized Army truck, developed by the Quartermaster's Department, according to authoritative advice received by AUTOMOTIVE INDUSTRIES. This announcement definitely settles the three standard Army trucks program which will include for the AA the G. M. C. ¾-ton truck, for the A the White 1½-ton truck, and for the B, the original B 3-ton heavy duty war truck.

It is understood that the White truck will be known as the A truck and will undergo certain changes in its specifications similar to those made in the AA and recently announced. No decision has been reached as yet as to the quantity of A trucks to be ordered, and bids have not been requested of the manufacturers. Major Brown, of the Motor Transport Service, in charge of this work, is making a trip through the middle West partly to determine the manufacturing possibilities for the A truck.

These decisions definitely settle the Army truck program, and point to a victory on the part of those who were opposed to the original standardized truck plans. It will be recalled that earlier there was considerable opposition on the part of certain standard truck makers to the first scheme, whereby standard ¾-ton, 1½-ton and 3-ton trucks designed by engineers called to Washington, were to form the bulwark of the United States Army Motor Transport Service. There was opposition created by some who felt that the original A and AA trucks were not mechanically correct, and by others who preferred to see their own trucks used by the army.

There was much feeling displayed on both sides for a time. The disagreement resulted in a reorganization of the Motor Transport Section into the new Motor Transport Service under Colonel Fred Glover, and in a series of tests ordered by Secretary of War Newton D. Baker. It is said that the selection of the G. M. C., the White and the original B trucks are the result of these tests although persons on each side of the controversy claim that the tests were not complete enough or of long enough duration to secure adequate results.



The new six-passenger Stephens Salient Six Model. This is built on the lines of the four-passenger model, but is longer to accommodate two auxiliary seats

—

219,292 Passenger Cars in Michigan

LANSING, July 23—Michigan had 219,292 licensed passenger cars on July 1, according to figures given out by the automobile division of the State department. In addition, there were 23,420 commercial vehicles, 6505 motorcycles, 561 dealers' licenses, 19,420 chauffeurs and 5446 transfers to other owners during the first half of the calendar year.

The license fees on the same date had reached a total of $2,689,490, of which $1,311,712 went to the counties in which the cars were owned, for good roads, while the balance went into the state highway fund. During the first quarter the money collected was $1,587,172, and the second quarter, or since April 1, $1,102,318.

—

Sanford Price Increased

SYRACUSE, N. Y., July 20.—The Sanford Motor Truck Co. has advanced the price of its 3½ and 5-ton trucks, effective Aug. 1, as follows:

Model	Old Price	New Price
W-35, 3½-ton	$3300	$3975
W-50, 5-ton	4690	4750

—

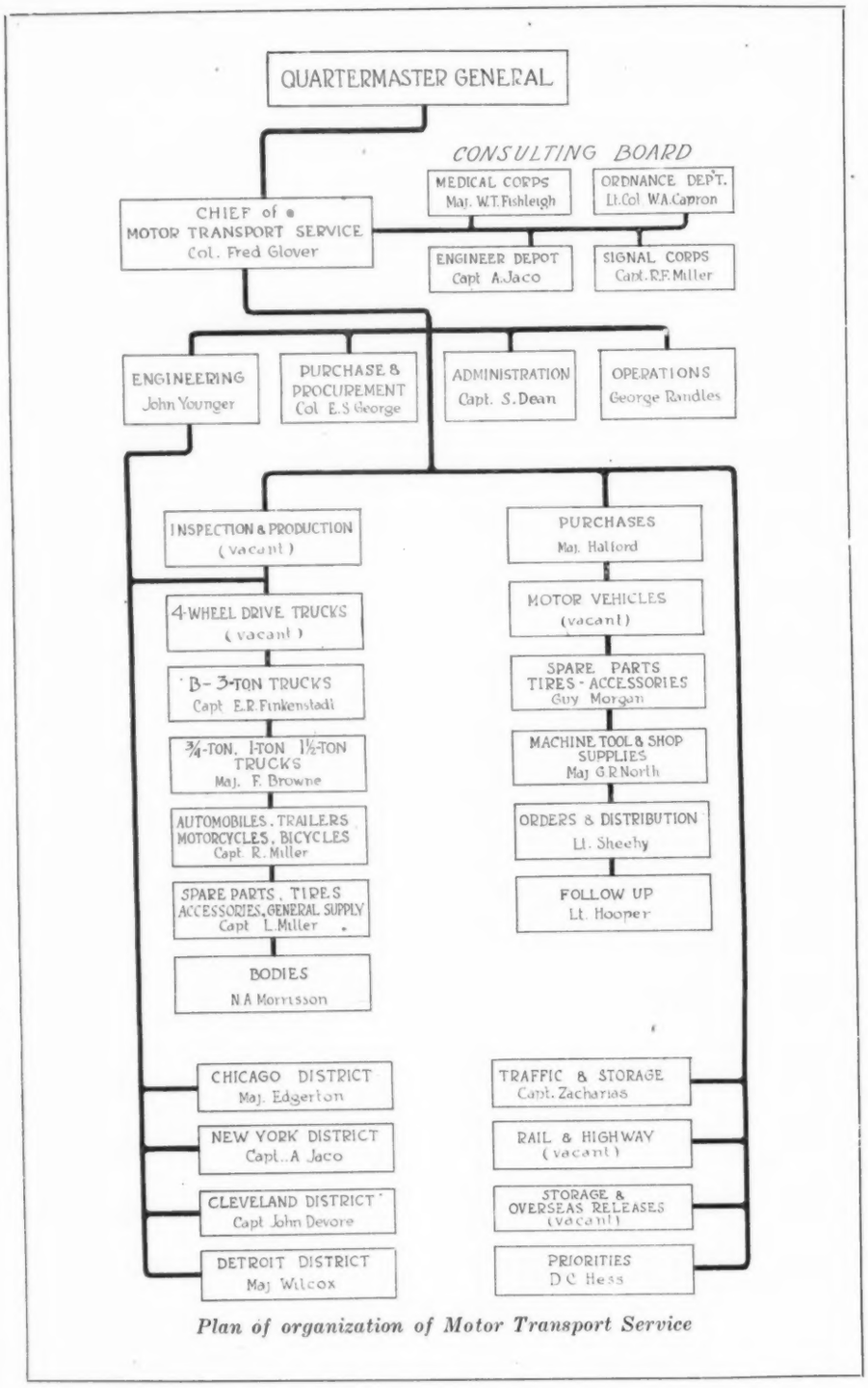
Ford Tractor Assn. Formed

DEARBORN, MICH., July 22.—For the purpose of discussing future policies of distribution and deciding the question of parts, distributers of Fordson tractors met in Des Moines, Iowa, on July 10. Representatives of forty-five states were present. All distributers agreed to sell parts at uniform prices regardless of the states in which they were located. As a result of this meeting the Ford Tractor Assn. was organized. C. L. Herring of Des Moines was elected president, C. L. Flint of Providence secretary, and C. H. Northway of New York treasurer.

—

Ford Notes to Be Bought

DETROIT, July 22.—The Auto Investment Co. has been formed by local business men for the purpose of buying notes given for the purchase of Ford cars. Under the plan, customers can purchase used Ford cars on liberal terms and provide the dealers the means of disposing of their customers' notes. Officers of the company are: President, Charles R. Talbot, vice-president of the National Bank of Commerce; vice-president, Paul Meyer, general manager of the Detroit Sales Co.; secretary and treasurer, Maurice W. Fox, president of the Maurice W. Fox Co.



Plan of organization of Motor Transport Service

Official Telegrams by Red Cross

WASHINGTON, July 23—The American Red Cross Motor Car Service, which includes more than 6000 women, will carry the official telegrams containing information regarding overseas casualties to the homes of the relatives of the killed or wounded. The original khaki uniform of this service has been discarded and replaced by a new regulation uniform of the Red Cross Oxford gray. Commanders will wear three silver diamonds embroidered on their shoulder straps. Captains will wear two silver diamonds, first lieutenants one, and second lieutenants a gilt diamond. Pearl gray tabs on the collar will indicate staff officers. Service stripes will be worn on the sleeves.

As a result of a conference recently held in Washington at the call of the director of the Bureau of Motor Corps Service, the motor service in six of the principal cities of the country which previously had been independent in its organization, was amalgamated with the Red Cross Corps. This makes the Red Cross Motor Corps Service a thoroughly co-ordinated institution, able to meet the local and interlocal demands for transportation throughout the land on a nationalized basis.

Motor Transport Service Spends 15% of All Money

(*Continued from page* 161)

ered to the Government to date. They are being turned out at the rate of 75 a day. The original program called for the production of 10,000 trucks by Aug. 1, but a serious delay in the delivery of engines and axles has prevented completion of the program as planned. It is now expected that all of the axles will have been delivered by Aug. 15 and possibly the engines by that same date. The delivery of the first 10,000, it is anticipated, will be completed by Sept. 15. Lieutenant Colonel Edwin S. George, who has been in charge of the procurement and purchasing of the Motor Transport Service since its inception, has been promoted to a colelnocy, and now is the second highest ranking officer in the Service under Colonel Glover.

—

More Lightless Nights Ordered

WASHINGTON, July 22—Lightless nights, effective July 24, are ordered by the Fuel Administration for an indefinite period. The order prohibits the use or consumption of coal, gas, oil or other fuel for illuminating or displaying advertisements, announcements or signs, or for the external ornamentation of any building on Monday, Tuesday, Wednesday and Thursday nights of each week in New England and the States of New York, Pennsylvania, New Jersey, Delaware, Maryland and the District of Columbia. The order also applies on Monday and Tuesday of each week in all remaining states. The order excepts only bonafide roof gardens, outdoor restaurants and outdoor moving picture theaters. Illumination or display by night in shop windows or any signs in show windows will be discontinued from sunrise to sunset and discontinued entirely on the lightless nights designated by the order. Street illumination will be reduced to that amount necessary for safety.

It is anticipated that 500,000 tons of coal a year will be saved by this plan.

—

Truck Service Operating on Schedule

DETROIT, July 22—The Inter-City Trucking Service, Inc., recently formed, is operating daily express service between Detroit, Flint and intermediate points. Operating 3-ton Denby trucks, the company sends out trucks from Detroit and Flint every morning, Sundays excepted, which pick up and deliver freight between the two cities.

Centrally located receiving stations are maintained in the larger towns, where shippers may send consignments at any time. Connections with other motor delivery companies in the state enable the Inter-City company to receive freight and guarantee delivery to many points in Michigan not covered by its own route.

52 Manufacturers at Salina

French Commission to Attend—S. A. E. to Stage Tractor Conservation Dinner

SALINA, KAN., July 22.—The list of exhibitors for the National Tractor demonstration which is to be held here July 29-Aug. 2, is practically complete, and includes 52 manufacturers of tractors and implements and 27 manufacturers of accessories.

A commission representing the French Government has made reservations at demonstration headquarters, and will remain throughout the week collecting data. It is expected the commission will include Lieut. Mattaine and Mr. Chace.

The Society of Automotive Engineers will hold a tractor conservation dinner at the Hotel Lamer on Wednesday, July 31, at 8 p. m. This dinner will be the big get-together of demonstration week, and it is expected that there will be a very large turnout. Following the dinner there will be seven or eight 20-minute talks by leading tractor engineers and manufacturers on pertinent subjects. The aim is to stage a dinner similar to the Orville Wright dinner recently held at Dayton, where aviation subjects were handled so successfully. Dinner tickets are $2.50 each.

Following is the complete list of exhibitors to date:

Tractors and Implements

Advance-Rumeley Thresher Co.	LaPorte
American Tractor Co.	Peoria
American Ford & Tractor Co.	Oklahoma City
Aultman & Taylor Co.	Mansfield
Avery Co.	Peoria
Beeman Cardon Tractor Co.	Minneapolis
Bull Tractor Co.	Minneapolis
Bullock Tractor Co.	Chicago
Case T. M. Co., J. I.	Racine
Case Plow Works	Racine
Cleveland Tractor Co.	Cleveland
Dart Motor Co.	Waterloo
Dauch Mfg. Co.	Sandusky
Deere & Co.	Moline
Electric Wheel Co.	Quincy
Emerson-Brantingham Co.	Rockford
Ford, Henry, & Son	Dearborn
Four-Drive Tractor Co.	Big Rapids
Frick Co.	Waynesboro
Grand DeTour Plow Co.	Dixon
Gray Tractor Co.	Minneapolis
Guaranteed Tractor Co.	Chicago
Hart-Parr Co.	Charles City
Hessian Tiller & Tractor Co.	Buffalo
Holt Co.	Peoria
Interstate Tractor Co.	Waterloo
International Harvester Co.	Chicago
Joliet Oil Tractor Co.	Joliet
LaCrosse Tractor Co.	LaCrosse
LaCrosse Plow Co.	LaCrosse
Lyons-Atlas Co.	Indianapolis
Lamson Tractor Co.	New Holstein
Moline Plow Co.	Moline
National Tractor Co.	Peoria
Nilsson Tractor Co.	Minneapolis
Parrett Tractor Co.	Chicago
Peoria Tractor Co.	Peoria
P. & O. Tractor Co.	South Bend
Port Huron Engine & Thresher Co.	Port Huron
Rock Island Plow Co.	Rock Island
Roderick Lean Mfg. Co.	Mansfield
Russell Co.	Massillon
R. & P. Tractor Co.	Alma
Simplex Straw Spreader Co.	Kansas City
South Bend Chilled Plow Co.	South Bend
Square Turn Tractor Co.	Norfolk
Three P. Auto Tractor Co.	Davenport
Turner Mfg. Co.	Port Washington
Velie Motor Corp.	Moline
Vulcan Mfg. Co.	Evansville
Wallis Tractor Co.	Racine
Waterloo Tractor Co.	Waterloo

Accessories

American Manganese Steel Co.	Chicago
Bosch Magneto Co.	New York
Buda Motor Co.	Harvey
Byrne-Kingston Co.	Kokomo
Champion Spark Plug Co.	Toledo
Automotive Parts Co.	Indianapolis
Diamond Chain Co	Indianapolis
Hyatt Roller Bearing Co.	Chicago
McQuay-Norris Mfg. Co.	St. Louis
Modine Radiator Co.	Racine
Timken Roller Bearing Co.	Canton
Splitdorf Electric Co.	Chicago
K-W Ignition Co.	Cleveland
Hooven Radiator Co.	Chicago
Vacuum Oil Co.	New York
Nuttall Co., R. D.	Indianapolis
Gurnee Ball Bearing Co.	Jamestown
Remy Electric Co.	Chicago
SKF Ball Bearing Co.	Hartford
Oakes Co.	Indianapolis
Domestic Engineering Corp.	Dayton
Lalley Light Co.	Detroit
Mutual Oil Co.	Kansas City
U. S. Ball Bearing Co.	Chicago
Universal Light Co.	Salina
Alamo Light Co.	Omaha

Liberty Plane Poster for Cadillac Workers

Men engaged in the airplane division of the Cadillac Motor Car Co. are constantly impressed with the patriotic nature of their work. Huge posters with patriotic appeals are published periodically and hung on the walls throughout the shops

Cadillac Making Census of Employees

DETROIT, July 23—The Cadillac Motor Car Co. is taking a census of its employees and classifying each person according to the character of work he can do. When the investigation is completed all the names will be placed in a card index under the proper classification. Each name will appear as many times as the number of different kinds of work he is fitted for. In other words, if a man is a drill press operator and also can operate an "Acme" screw machine, he is listed under both classifications, thus enabling the company to put its hands on all the operators of a certain kind at one time.

It has been brought to the attention of the officials of the company frequently where one man could be fitted in several various positions. By means of the information gathered in the ceusus, the company, if necessary, can transfer men from one department to another, thereby placing them where they are most needed. The census has already revealed places where men can be released for more important work and replaced by women.

—

Cleary to Handle Cadillac Advertising

DETROIT, July 23—Due to the resignation of L. N. Burnett, advertising manager of Cadillac Motor Car Co., who has joined the colors, Johh A. Cleary has been called from Philadelphia to take charge of the advertising department until more definite arrangements can be made. He has been handling the advertising of the eastern distributers.

—

Chevrolet to Vacate New York Plant

NEW YORK, July 23—The Chevrolet Motor Co. will vacate its manufacturing plant in New York City about Sept. 1. The entire equipment is to be removed to the Tarrytown, N. Y., plant and manufacturing activities for eastern territory centered there. The principal offices, however, will remain in New York at Broadway and 57th Street.

Men of the Industry

Changes in Personnel and Position

Marathon Executives Enlist in Army

CUYAHOGA FALLS, OHIO, July 20.—Three of the executives of the Marathon Tire & Rubber Co. have joined the colors. Secretary Raymond D. Jenks has enlisted in the Gas Defense Service at Washington and reports for duty at once; Purchasing Agent Russell Farley has enlisted in the Ordnance Department and is stationed at the Rock Island Arsenal. Floyd R. Biggs, factory representative in Kansas City, has enlisted in the infantry service.

—

C. F. Batchelder, for the last 2 years assistant sales manager of the Dort Motor Car Co. and for 10 years previous sales manager of the John Deere Plow Co., St. Louis, has been appointed eastern division sales manager of the Olds Motor Works, Lansing. He succeeds N. W. Barton, who has been transferred to New York City with the Oldsmobile Co. of New York.

—

George L. East has resigned as assistant sales manager of the Olds Motor Works, Lansing, Mich., to become associated with the Gulf Oldsmobile Co., New Orleans, in the distribution of the Oldsmobile throughout Louisiana. His connection with the Olds company dates from 1907, and includes 5 years as advertising manager, several years as wholesale representative, and 1½ years as assistant sales manager.

—

Homer Beckenbach, formerly assistant sales manager of the Cleveland branch of Willys-Overland, Inc., has entered Government service as inspector in the drop-forging department of the Ordnance Department in Detroit.

—

E. F. Howells has been appointed district sales manager for the Sanford Motor Truck Co., Syracuse. His territory will include New York and Pennsylvania. He was formerly Philadelphia manager for the Chase Motor Truck Co.

—

George C. Whitman has joined the Oakland Motor Car Co. as social service director. He will formulate plans for the betterment of working conditions among the employees.

—

George Woelfel, Jr., formerly secretary to Commissioner William M. Webster of the National Assn. of Automobile Accessory Jobbers, has joined the Zinke Co., Chicago, as special representative.

—

H. O. Penland, sales engineer of the U. S. Ball Bearing Mfg. Co., Chicago, with headquarters in Cleveland, has been promoted to the managership of the company's Cleveland office.

—

Warren A. Maxwell, son of S. W. Maxwell of the Michigan State Automobile School, Detroit, and formerly associated with the Detroit service branch of the Studebaker Corp., has received a commission as second lieutenant in the Aviation Section of the army.

—

E. F. Sullivan has been appointed chief engineer of the Homer-Laughlin Engineers Corp., Los Angeles. He will design a small creeper-type tractor which will be shown in the September demonstration.

—

M. H. Breeze, formerly publicity manager for the B. F. Goodrich Co. and associated with that company's Cleveland branch, has resigned and has joined the Metal Parts Co., Detroit.

—

Fisk Export Manager Starts on Trip

NEW YORK, July 16—John B. Maus, export manager of the Fisk Rubber Co., has sailed on an extended business and research trip through Latin-American countries, and will be gone for a year or longer. His itinerary embraces Cuba, Chile, Peru, Bolivia, Ecuador, Argentina, Brazil, Uruguay and the north shore of South America, as well as Central American colonies.

—

Diamond-T Distributers Changed

MILWAUKEE, July 20.—Distribution of Diamond-T trucks in the State of Wisconsin has changed hands through the sale of the agency by John H. Ryan to the Upham-Schacht Co. Ryan will continue to distribute in the states adjacent to Wisconsin from new headquarters in Minneapolis and St. Paul.

—

Goodyear Branch Managers Transferred

AKRON, OHIO, July 22.—The Goodyear Tire & Rubber Co. has made several changes in its personnel of branch managers. L. C. Alexander, formerly supervisor of salesmen for the Indianapolis district, has been appointed manager at Cincinnati, succeeding E. G. Shick, promoted to the automobile tire department at Akron. J. S. Taylor, formerly sales supervisor of the Southern district, is now manager at Jacksonville, Fla., succeeding J. J. Kendall, now in the Federal service. H. C. Davies is acting branch manager at Dallas, Tex., replacing R. S. Brace, also in the Federal service. J. M. Dine, formerly branch manager at Omaha, has been appointed assistant manager at the Chicago branch, and C. A. Cramer, formerly manager at Cedar Rapids, has succeeded him at Omaha. E. L. Luthey has been promoted from supervisor of sales at Chicago, to branch manager at Cedar Rapids.

—

Floyd Robinson Dies

DETROIT, July 20.—Floyd M. Robinson, former advertising manager of the Regal Motor Car Co., Detroit, and later with the Marion-Handley Co., Jackson, Mich., in the same capacity, is dead.

New Companies Formed

Latest Additions to Ranks of Automotive Industries

Gillette Men Form New Rubber Company

EAU CLAIRE, WIS., July 22.—Interests identified with the active ownership and management of the Gillette Rubber Co. have organized the Chippewa Rubber Co. to engage in the manufacture of rubberized fabrics of all kinds, principally waterproof covers, hospital sheeting, rubber coats and similar goods. A 2-story factory adjacent to the Gillette plant is being completed and will be ready to start regular production Sept. 1. From 75 to 100 men and girls will be employed at the start. The Gillette and Chippewa companies are distinct and separate. Officers of the new company are: President, Edward Hutchens; vice-president and general manager, E. C. Gavin; second vice-president, J. J. Ott; secretary, R. B. Gillette; treasurer, S. B. Woodward, New York. The capital stock is $250,000.

—

To Make Puncture-Proof Tire

MILWAUKEE, July 22.—The Everwear Rubber Co., which was organized a short time ago with an authorized capital stock of $200,000, will manufacture a substantially punctureless, no-blowout, inner tire of a new type. The company has purchased all patent rights, which were granted to the inventor Jan. 12, 1918. The inner tire is of the pneumatic type, but is protected by a cellular cushion hoop separating the tube from the casing.

—

Dependable Truck & Tractor Formed

GALESBURG, ILL., July 22.—The Dependable Truck & Tractor Co. has been organized here for the manufacture of commercial vehicles, and is now seeking a suitable factory. Officers have been elected as follows: President, C. V. Morse; vice-president, H. C. Pfaff; secretary-treasurer, J. J. Welch. A. E. Patchin has been appointed sales and advertising manager. With the exception of Welch, all the officers were until recently associated with the Pan-American Motors Corp., Decatur, Ill.

—

To Make Marco Speed Recorder

EAST MOLINE, ILL., July 22.—The Motor Appliance Co. has been organized here to manufacture automobile appliances, and has taken over the plant of the Ogden Mfg. Co. at Plymouth, Ind. Three specialties will be featured. These are the Marco speed recorder, which records instantly the exact rate of speed made per hour. the total number of miles traveled and the number of stops; the Benson automatic speed signal, and Ogden automobile parts.

Janesville Machine Co. Reorganized by G. M. C.

JANESVILLE, WIS., July 22.—The reorganization of the Janesville Machine Co., manufacturer of farm machinery, under the direction of the General Motors Corp., which recently acquired the controlling interest, has been completed. The capital stock of $2,250,000 has been divided into 12,500 shares preferred and 10,000 common shares. The former capital was $750,000. Officers have been elected as follows: President, J. A. Craig; first vice-president, A. P. Lovejoy; second vice-president, G. V. Sullivan; treasurer, M. G. Jeffris; secretary, E. B. Davis. Mr. Craig was general manager of the company under the former ownership. General Motors made a deposit of $1,095,000 in the First National Bank of Janesville on the day the transfer was formally made.

—

To Auction Detroit-Wyandotte Plant

WYANDOTTE, MICH., July 20.—The plant of the defunct Detroit-Wyandotte Motor Truck Co., consisting of one building, 300 x 60, of approximately 40,000 sq. ft., will be sold at auction on the premises by Samuel L. Winternitz Co., Chicago.

—

To Double Allen-Bradley Capacity

MILWAUKEE, July 22.—The Allen-Bradley Co., manufacturer of rheostats, electric controlling devices, and charging sets for storage battery and electric vehicle work, is doubling the capacity of its plant by the erection of a 3-story addition and adding several stories to the present main shop.

—

Teetor-Hartley Gets Government Order

HAGERSTOWN, IND., July 22.—The Teetor-Hartley Motor Corp. has received a contract for exhaust manifolds to be used in the new engines which will be installed in tanks. The first order calls for 1500 manifolds.

—

Walden-Worcester Opens Chicago Branch

WORCESTER, MASS., July 20.—The Walden-Worcester, Inc., manufacturer of Walden-Worcester wrenches, has opened a branch office in Chicago. It will be under the supervision of Messrs. Craig & Opdyke.

—

War Contracts for Edison Industries

NEW LONDON, WIS., July 22.—The Wisconsin plant of Thomas A. Edison Industries, Inc., is completing a contract for approximately 135,000 sq. ft. of airplane construction material for the British Government. Delivery is to be made by Aug. 15. The material consists of panels of 3-ply veneer, the outer plies being of birch and the filler-ply of basswood. It is said to differ materially from this Government's requirements for such material. The New London plant is also manufacturing 20,000 trunk-type filing cases for the U. S. Government for the use of the army in the field.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Hayes-Ionia Expands Plant

GRAND RAPIDS, July 15.—The Hayes-Ionia Co. has completed a 3-story addition to its plant. A short time ago the company took over the plant erected by the Nelson-Matter Furniture Co., moving its general offices from Ionia, Mich. The plant at Ionia is still in operation. More than 1700 men are employed in the two factories, the local plant having the greater number. The two factories have a floorspace of more than 600,000 sq. ft.

—

Capital Increase

The Deitrich Motor Car Co., Youngstown, Ohio, has increased its capital stock from $15,000 to $25,000.

—

Dividends Declared

The Michigan Drop Forge Co., Pontiac, Mich., has declared the July dividend of 20 cents a share upon the common stock, payable Aug. 1 to holders of record July 15.

The Russel Motor Car Co., Toronto, has declared its regular quarterly 1¾ per cent dividend on preferred stock, payable Aug. 1. A dividend of 7 per cent on common stock, payable Aug. 1, has also been declared.

The Grant Motor Car Corp., Cleveland, declared its regular quarterly 1¾ per cent dividend on preferred stock, payable Aug. 1.

The Falls Motors Corp., Sheboygan Falls, Wis., has declared its regular quarterly dividend of 1¾ per cent on preferred stock and a dividend of 5¼ per cent in scrip on preferred stock, both payable July 20.

The Packard Motor Car Co., Detroit, has declared a cash dividend of 2 per cent on common stock, payable July 31, to stockholders of record July 15.

The Kelly-Springfield Tire Co. has declared a dividend of $1 a share on common stock, payable Aug. 1 to stock of record July 15.

The Fisher Body Corp. has declared a regular quarterly dividend of 1¾ per cent on preferred stock, payable Aug. 1 to holders of record July 23.

The Chevrolet Motor Co. has declared a quarterly dividend of 3 per cent, payable Aug. 1 to stock of record July 15.

The General Motors Corp. has declared quarterly dividends of 3 per cent on common and 1½ per cent on preferred stock, payable Aug. 1 to holders of record July 15.

The Michigan Drop Forge Co., Detroit, has declared an extra dividend of 10 cents a share on the common stock, payable July 25.

Bosch Plainfield Plant to Be Occupied by Wasson

NEW YORK, July 20.—The Plainfield, N. J., plant of the Bosch Magneto Co., which, as was told in AUTOMOTIVE INDUSTRIES last week, has been purchased by the Wright-Martin Aircraft Co., is to be occupied by the Wasson Piston Ring Co., which will remove its equipment from New Brunswick, N. J., and turn over its plant to the Wright-Martin company. This will give the Wright-Martin company an additional plant in New Brunswick and will permit considerable expansion. The company is at present producing about 500 engines a day in its New Brunswick plant and about 40 engines a day in the Long Island City plant. Much new machinery was purchased last week.

—

Traffic Trucks To Be Shown at Chicago

ST. LOUIS, July 20.—The Traffic Motor Truck Corp. will make the first public exhibition of its 2-ton trucks at the Automotive and Accessory Exposition in Chicago, Sept. 14-21. It is stated that the company is producing at the rate of 300 trucks a month.

—

Women Drivers Used at Buick

FLINT, MICH., July 22.—The Buick Motor Co. is using women to drive cars from the assembling plant to the loading platform, and the company says that the plan is working out excellently. Fourteen women are doing the work, and their duties are confined merely to the driving of cars. Besides driving from the assembling plant, the women also take the cars from the warehouse to the company's garage to be delivered to dealers who come to drive cars away. They are well satisfied with this work and are performing their duties as well as the men they superseded, according to an official of the company.

—

Automotive Battery Corp. Takes Prest-O-Lite Service

BOSTON, July 13—The Automotive Battery Corp. has been formed here to take over the service of Prest-O-Lite products in this vicinity. James MacKenzie, formerly in charge of the Willard battery interests at Springfield, Mass., and later purchasing agent at the Watertown Arsenal, is president and general manager. George Bradburn of the Bradburn Motors Co. is treasurer. The company has leased quarters at 701 Beacon Street and has plants at Cambridge and Springfield. J. A. O'Donnell, manager of the Prest-O-Lite branch, retains his position as representative of the factory in New England.

—

Sales Increase 100 Per Cent

KENT, OHIO, July 20.—Sales of the Mason Tire & Rubber Co. for June were $302,123. This is an increase of more than 100 per cent over June, 1917.

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Coal Production Records Touch New High Level

Production records in the bituminous fields are being smashed. Coupled with the cheering news of the victories of our boys and the Allies at the Marne, the successful onslaught on the storehouse of Mother Nature by the mining forces at home furnishes cause for a new song of jubilation. Every soft-coal region is reporting greater output than ever before. For the week ended July 13 the total of bituminous coal shipped from the mines amounted to 13,243,000 net tons, which is more than a million tons above the average weekly requirements set by the Fuel Administration as necessary to meet essential demands. The average weekly production of soft coal from April 1 to date, however, is estimated at 11,568,000 net tons. Therefore, to make up the total deficit of 9,615,000 net tons which now exists it will be necessary to have approximately ten more weeks of production equivalent to that of the week ended July 13, or an output of 12,472,000 net tons during each of the 37 weeks remaining in the coal year, which ends March 31, 1919. During the week under review shipments of anthracite amounted to 42,331 cars, which shows a slight improvement over the forwardings of recent weeks.—*Coal Age.*

Need of Truck Makers For Steel

(*Continued from page* 134)

"We are led to believe that for every million men sent to the war front, something between 30,000 and 50,000 trucks will be required.

"It is also suggested that the United States Government will eventually use a large number of trucks at home.

"In order that motor truck plants may be kept up to their top efficiency, and their personnel maintained intact, so that they may meet any demands an enlarged program will make on them, it is necessary that these plants be kept alive in the interval.

"This is only possible through domestic business. Not enough war work is in sight as this time. The domestic business is a hand, and discharges a patriotic utility.

"There seems therefore every reason why the War Industries Board should class motor trucks with such other transportation utilities as locomotive engines, freight cars and steamships, find a means to issue the same priorities that go to war necessities, and see that the necessary materials are available in order that motor truck production be not interrupted.—National Motor Truck Committee of the N. A. C. C."

Government Places Demands Before Steel Manufacturers

More impressively than in any previous week the Government has put before the steel producers the demands it will make upon the country's capacity in the next six months and the still greater needs of 1919.

It is now realized that the ship program is to be increased next year beyond anything yet believed, that railroad purchases must far exceed those for 1918 after years of starvation buying, and that shell steel must be furnished at a 5,000,000-ton rate. Moreover, the strain great crops have always put upon iron and steel capacity is also to be reckoned with now.

In its third warning to consumers of steel within three months the War Industries Board put the needs of the second half of the year for war and essential industries at 20,000,000 tons of finished steel products, or 3,500,000 tons more than the expected output. A sharp challenge of the 20,000,000-ton estimate came from automobile interests.

No assurance has been given, nor can it be given, the most certain thing in the prospect being that the use of steel for war purposes will increase, while increased production is less likely.—*Iron Age.*

Summary of General Business Conditions as of June 23, 1918

Following is a Summary of Business Conditions on June 23, as Reported to the Federal Reserve Board:

District	General Business	Crop Condition	Industries of the District	Construction, Building, and Engineering	Foreign Trade	Money Rates	Railroad, Post Office, and Other Receipts	Labor Conditions
No. 1—Boston	Active	Average, promising	Busy	Decreased	Increased	Steady and strong	Mixed	Scarce; wages high
No. 2—New York	Very active	Good	Engaged to full capacity; widespread adaptation of production to war essentials.	Dull, except for construction of Army warehouses, shipyards, housing for Government labor and factory construction.	Many restrictions, but large aggregate.	Firm and steady	Post office increase, 19.28 per cent over last year; railroads show increase in gross and decrease in net earnings.	Scarcity and high competitive wage offers, resulting in large turnover.
No. 3—Philadelphia	Very good	Excellent	Very busy	Very little new building.	Large	Firm; no change	Gross receipts increasing.	Shortage acute in all lines.
No. 4—Cleveland	Good	Satisfactory and promising.	Busy	Very dull		Increasingly firm	Increase	Unsatisfactory; scarcity.
No. 5—Richmond	Active, limited only by labor and supplies.	Excellent	Active, profitably employed.	Private building negligible; Government work active.	Limited by freight room.	Six per cent; heavy demand and increasing.	Railroad irregular; post office, volume large; reflects increased rates.	Inadequate; unsatisfactory.
No. 6—Atlanta	Good	Very satisfactory	Busy	Inactive	Unsatisfactory	Firm		Unsettled.
No. 7—Chicago	Very active	Excellent	Generally at capacity.	Dull		Do	Post office receipts decrease under last month.	Very scarce.
No. 8—St. Louis	Good	Do	Active	Do		Do	Increase in postal receipts.	Nearing settlement.
No. 9—Minneapolis	Do	Do	Do	Fair		Very firm	Not much change	Good.
No. 10—Kansas City	Do	Good to excellent	Do	Slightly improved		Firm		Equalization of farm demand and supply.
No. 11—Dallas	Quite satisfactory.	Fair to good	Do	Building activities below normal; Government work has right of way.	As satisfactory as shipping space available permits.	Firm, heavy demand but slight evidence of increase.	Railroad increase and higher tariffs not noticeable in travel; post office increase.	Unsatisfactory; shortage in all branches.
No. 12—San Francisco.	Active	Good	Do	Operations generally curtailed.	Increase	Firm	Increasing	More settled.

AUTOMOTIVE MATERIALS MARKETS

Material Market Prices

Acids:
Muriatic, lb. ..... .02-.03
Phosphoric, ct. .... .35-.39
Sulphuric (60), lb.. .11

Aluminum:
Ingot, lb. ..... .33
Sheets (18 gage or more), lb. ..... .40

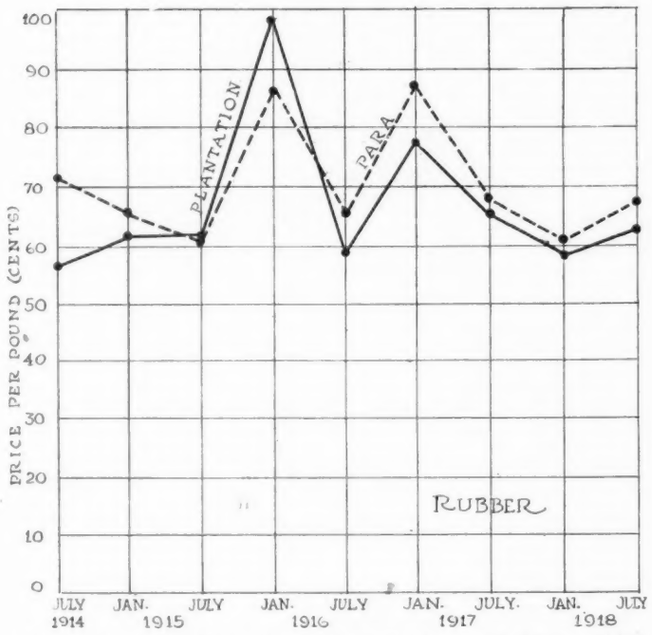
Antimony, lb. ..... .13⅛-.13⅜

Burlap:
8 oz., yd..... .18½-.19
10 oz., yd..... .23½-.24

Copper:
Elec., lb. ..... .26
Lake, lb ..... .26

Fabric, Tire (17¼ oz.):
Sea is., combed, lb..1.65-1.70
Egypt, combed, lb..1.25-1.35
Egypt, carded, lb...1.20-1.30
Peelers, combed, lb..1.05-1.20
Peelers, carded, lb.. 95.-1.05

Fibre (⅛ in. sheet base), lb. ..... .50



Fluctuations in the prices of Plantation and Para rubber since the beginning of the war

Graphite:
Ceylon, lb. ..... .07½-.25
Madagascar, lb. ... .10 -.15
Mexican, lb ..... .03¾

Lead, lb. ..... .07¾

Leather:
Hides, lb. ..... .19-.33

Nickel, lb. ..... .40

Oil:
Gasoline:
Auto., gal. ..... .24
68 to 70 gal..... .30
Lard:
Prime City, gal. 2.20
Ex. No. 1, gal.. 1.50-1.52
Linseed, gal. 1.82
Menhaden, gal. ... 1.05
Petroleum (crude):
Kansas, bbl. ... 2.25
Pennsylvania, bbl. 4.00

Rubber:
Ceylon:
First latex pale crepe, lb. ..... .63
Brown, crepe, thin, clear, lb. ..... .60
Smoked, ribbed sheets, lb. ..... .62
Para:
Up River, fine, lb. .68
Up River, coarse, lb. ..... .40
Island, fine, lb... .59
Island, coarse, lb. .27

Shellac (orange), gal. .70-.76

Spelter ..... .04½

Steel:
Angle beams and channels, lb. .... .03
Automobile sheet (see sp. table).
Cold rolled, lb..... .06½
Hot rolled, lb..... .03½

Tin ..... .95

Tungsten, lb. 2.40

Waste (cotton), lb... .12¾-.17

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only. Per 100 lb.	Primes when seconds up to 15 per cent are taken. Per 100 lbs.
Automobile body stock	$5.95	$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45

Automobile Sheet Extras for Extreme Widths:
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.

Black sheet extras to apply to narrow widths.
Oiling, 10c. per 100 lb.
Patent leveling, 25c. per 100 lb.
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.

Seconds, ten per cent less than the invoice Pittsburgh price for corresponding primes.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co	63	65	..
*J. I Case T. M. Co., pfd	80	86	+1
Chalmers Motor Co., com	3	6	..
Chalmers Motor Co., pfd	20	30	..
*Chandler Motor Co	84½	85½	+4½
Chevrolet Motor Co	132	135	..
*Fisher Body Corp., com	37	38	—1
*Fisher Body Corp., pfd	91	92	+2
Fisk Rubber Co., com	55	58	..
Fisk Rubber Co., 1st pfd	98	103	..
Fisk Rubber Co., 2nd pfd	78	83	..
Firestone Tire & Rubber Co., com	108	111	+10
Firestone Tire & Rubber Co., pfd	93	95	..
*General Motors Co., com	153	156	+1
*General Motors Co., pfd	81	82	..
*B. F. Goodrich Co., com	47	47½	+2
*B. F. Goodrich Co., pfd	97	100	+1½
Goodyear Tire & Rubber Co., com	163	167	+2
Goodyear Tire & Rubber Co., pfd	96½	97½	..
Grant Motor Car Corp	2½	3½	+ ½
Hupp Motor Car Corp., com	3⅞	4⅜	+1
Hupp Motor Car Corp., pfd	80	85	+4
International Motor Co., com	30	33	—2
International Motor Co., 1st pfd	55	65	+5
International Motor Co., 2nd pfd	35	43	..
*Kelly-Springfield Tire Co., com	50	51	..
*Kelly-Springfield Tire Co., 1st pfd	82	87	..
*Lee Rubber & Tire Corp	19	20	+1
*Maxwell Motor Co., Inc., com	29	29½	+1
*Maxwell Motor Co., Inc., 1st pfd	56	57	+2
*Maxwell Motor Co., Inc., 2nd pfd	27⅞	23	+1
Miller Rubber Co., com	111	113	+8
Miller Rubber Co., pfd	93	•95	..
Packard Motor Car Co., com	118	125	..
Packard Motor Car Co., pfd	94	97	+1
Paige-Detroit Motor Car Co	18	20	..
Peerless Truck & Motor Corp	14	17	..
Portage Rubber Co., com	111	113	+8
Reo Motor Car Co	13½	15	..
*Saxon Motor Car Corp	7	8	+1¼
Standard Motor Construction Co	12	14	..
Standard Parts	60	62	..
*Stewart-Warner Speed. Corp	57½	58½	—1⅞
*Studebaker Corp., com	46⅛	46⅜	+ ⅞
*Studebaker Corp., pfd	82¼	90	..
Swinehart Tire & Rubber Co	50	58	—4
United Motors Corp	32½	33	— ½
*U. S. Rubber Co., com	61¾	62¼	+1¾
*U. S. Rubber Co., pfd	103½	105	+1¼
*White Motor Co	42½	42¾	+ ¾
*Willys-Overland Co., com	20	20½	+ ¾
*Willys-Overland Co., pfd	81¾	82¾	— ¼

*At close. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	Bid	Asked	Net Ch'ge
ACTIVE STOCKS			
Auto Body Co	..	7¾	..
Bower Roller Bearing Co	16½	18½	..
Chevrolet Motor Co	131	135	—1
Commerce Motor Co	..	..	..
Continental Motor Car Co., com	5½	5⅝	..
Continental Motor Car Co., pfd	..	..	..
Edmunds & Jones, com	14	17	..
Edmunds & Jones, pfd	75	90	—5
Ford Motor Co. of Canada	179	185	+9
Hall Lamp Co	13¼	14	+1
Michigan Stamping Co., com	12¾	..	..
Motor Products	..	..	..
Packard Motor Car Co., com	..	124	..
Packard Motor Car Co., pfd	94	..	+ ⅛
Paige-Detroit Motor Car Co	..	18½	..
Prudden Wheel Co	..	12⅛	..
Reo Motor Car Co	14¼	14⅞	+ ⅛
INACTIVE STOCKS			
Atlas Drop Forge	..	26	..
Kelsey Wheel Co	25	..	..

General Engineer Contracts

WASHINGTON, July 17.—The following contracts have been awarded by the General Engineer Depot, War Department:

July 8, 1918.

American Lubricator Co., Detroit; steam lubricators.

Diamond Chain & Mfg. Co., Indianapolis; links, motor chains.

Gray Motor Co., Detroit; gasoline engines.

July 9, 1918.

Gray Motor Co., Detroit; spare parts for gasoline engines.

Goodyear Tire & Rubber Co., Philadelphia; hose, suction.

Quaker City Rubber Co., Philadelphia; hose.

H. W. Johns-Manville Co., Washington; asbestos-felted insulation.

Studebaker Corp. of America, Detroit; automobile spare parts.

July 11, 1918.

Republic Rubber Co., Washington; tire casings.

The Seiss Mfg. Co., Toledo; horns.

July 12, 1918.

The Winton Co., Cleveland; parts of power plants for searchlights.

Dodge Brothers, Detroit; parts for Dodge Brothers cars.

Studebaker Corp. of America, Detroit; rims for Studebaker cars.

Garford Motor Truck Co., Lima, Ohio; hubdometers.

—

WASHINGTON, July 22—The following contracts were placed by the General Engineer Depot of the Army:

July 13, 1918.

United States Graphite Co., Saginaw; graphite compound.

Fir Production Board, Washington; select common fir.

Champion Spark Plug Co., Toledo; spark plugs.

General Electric Co., Washington; exhaust fans.

American Oil, Pump & Tank Co., Cincinnati; portable steel tanks.

Acme Rubber Mfg. Co., Trenton, N. J.; hose.

Goodyear Tire & Rubber Co., Washington; rubber gaskets.

Ford Motor Co., Detroit; parts for searchlight carriages.

Roberts Brass Co., Milwaukee; gate valves.

Republic Rubber Co., Youngstown, Ohio; hose.

—

Hide Prices Fixed

WASHINGTON, July 22—Prices have been fixed by the War Industries Board for hides as follows:

Packer Hides

Heavy native steers No. 1, 30 cents.
Heavy butt branded steers No. 1, 28 cents.
Heavy Texas steers No. 1, 28 cents.
Heavy Colorado steers, 27 cents.
Light native cows No. 1, 24 cents.

Country Hides (for Best Sections)

Extremes, 25 to 45 pounds, 22 cents.
Buffs, 45 to 60 pounds, 21 cents.

River Plate Frigorifico Hides

Maximum price on steers, $53.00 Argentine gold.

Maximum price on cows, $40.00 Argentine gold.

The prices are f.o.b., shipped, including export duty and lighterage, but not including salting charges. The prices are the basis for all other differentials which will be published in due course. They are expected to equalize more nearly the actual market conditions as reflected in prices of country hides.

—

Women's Division of Labor Department

WASHINGTON, July 22—A Women's Division in the Department of Labor has been established. Miss Mary Van Kleeck who has been the supervisor of the Women's Division of the Industrial Service Section of the Ordnance Department has been appointed chief. She will serve as a member of the War Labor Policies Board, will co-ordinate the work for other women in the divisions of the Department of Labor, will co-operate with state Departments of Labor and will endeavor to bring about united action by the various states in national problems of women's work. The Women's Division will concern itself primarily with war conditions, but will be mindful of the need for observing and interpreting the tendencies in women's employment which are likely to have permanent social effects.

—

Marlin-Rockwell Takes Braeburn Plant

BRAEBURN, PA., July 23—The Marlin-Rockwell Corp. has acquired the plant of the Braeburn Steel Co. here. The property will be developed and equipment added as a means of insuring continuity of supply of alloy steel.

Contracts

Navy Contracts Awarded

WASHINGTON, July 20.—The Bureau of Supplies and Accounts of the Navy has placed contracts as follows:

July 8, 1918.

Winhter Motor Truck Co., Winthrop Harbor, Ill.; truck.

July 18, 1918.

Packard Motor Car Co., Detroit; motor trucks.

Empire Rubber & Tire Co., Trenton, N. J.; tires and tubes.

Ford Motor Co., Detroit; ambulance.

The Burgess Co., Marblehead, Mass.; boxing airplanes.

—

Medical Corps Contract Awards

WASHINGTON, July 15.—The Surgeon General of the Army has issued the following contracts and purchases:

June 29, 1918.

General Motor Truck Co., Pontiac; spare parts for chassis.

H. H. Babcock Co., Watertown, N. Y.; ambulance spare parts.

July 6, 1918.

Pemberty Injector Co., Detroit; automatic injectors.

Detroit Graphite Co., Detroit; paint.

Gray Motor Co., Detroit; gasoline engines.

—

Indianapolis Elects Automotive Committee

INDIANAPOLIS, July 22—Members of the automotive committee of the Indianapolis division of the War Industries Board were elected Saturday. Walter C. Marmon, of Nordyke & Marmon, Indianapolis, was elected chairman. Others who will serve on the committee are: Alvin H. Smith, Ford Motor Co., vice-chairman; J. A. Bennell, Haynes Automobile Co., Kokomo; Robert H. Hassler, Robert Hassler, Inc., Indianapolis; George M. Dickson, National Motor Car & Vehicle Corp., Indianapolis; C. E. Lee, Buckeye Mfg. Co., Anderson; R. P. Henderson, Barry Mfg. Co., Indianapolis; E. H. Holmes, Stewart Wire Wheel Corp., and R. O. Bright, Arvac Mfg. Co., Anderson.

—

Union Switch Adds Equipment

SWISSVALE, PA., July 23—The Union Switch & Signal Co. has installed several additional steam drop and shaping hammers. Plans for the extension of the die room and increased facilities for heat treating are being prepared.

Calendar

RACING

July 27 — Chicago. Chicago Speedway.
Aug. 3—Uniontown. Uniontown Speedway Assn.
Aug. 10—Providence, R. I.
Aug. 17—Sheepshead Bay.
Sept. 2—Uniontown. Uniontown Speedway Assn.
Sept. 7 — Chicago. Chicago Speedway.
Sept. 21—Sheepshead Bay.
Oct. 5 — Cincinnati. Cincinnati Speedway.

SHOWS

July 27—Syracuse, N. Y. Tractor Demonstration. New York State Food Commission.

July 29-Aug. 4—Salina, Kan. National Tractor Demonstration. Auspices of National Implement and Vehicle Assn.

Aug. 6—Fulton, N. Y. Tractor Demonstration. New York State Food Commission.

Sept. 2-7—Indianapolis, Indiana. State Fair. Indianapolis Automobile Trade Assn.

Sept. 14-21—Chicago. Automotive and Accessories War Exposition. Municipal Pier.

Oct. 14-27—Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.

Oct. 16-18—Ottawa, Ont., International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

ENGINEERING

Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.